What's in this issue—

Conventional practice of making automobiles has been succeeded by a design whereby the **body and frame are integral.** Lincoln-Zephyr has such a design which has changed assembly methods. The new technique, in pictures, is shown on pages 362-363.

Do you know the **cutting speeds for high-speed saws used for cutting-off or slotting operations?** You will find a reference table of data on this subject on page 379. It is part of the American Machinist reference book sheet service which is a feature of every issue.

All railroad shop men will want to know the latest dope on **press fits.** One of our editors traveled around the country a lot to gather the facts. His findings are on page 364.

Just **how essential is the modern machine tool** to the country **in a national emergency?** Howard W. Dunbar, president National Machine Tool Builders Association, ably answers that question on page 360.

How to grind non-metallic rollers is told in detail on page 382. This is only one of a number of "Ideas From Practical Men" to be found in this issue. These ideas save you money.

Landing gear forks for airplanes must be extremely strong to take safely the stresses which are put on them. One of our editors visited the Glenn L. Martin plant to see how these forks are made. He describes on page 368 the **welding, heat-treating and machining of these vital parts** which are made of tough alloy steel. Photographs and a sketch amplify his article.

Unless used carefully, **wire measurements** may cause trouble **in checking threads.** Oscar E. Koehler, chief engineer, Greenfield Tap & Die Corporation, tells you on page 367 how to avoid errors.

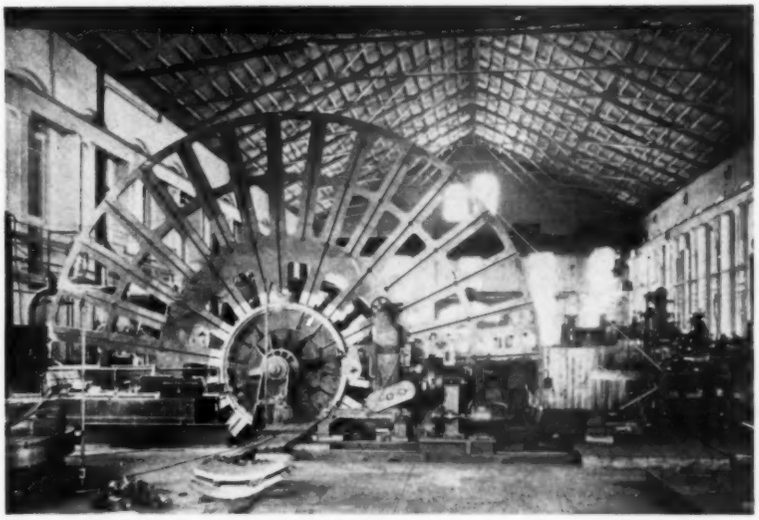
"Dad" works in a large factory. He is father confessor, counselor and at times the banker for the workmen. His views reflect 50 years of hard work and keen observation. In the first of a series of short articles, he talks to you on page 359 about **why you "got to have discipline in a factory."**

How does an efficient jobbing die-casting plant operate? On page 372 is a complete description, with good photographs, of the factory of the Continental Die Casting Corporation with emphasis on the use of ingenious press tools and tapping fixtures.

Accuracy of a turret lathe depends first on how carefully the bed is machined. George L. Kluter of Warner & Swasey Company tells on page 376 **how his company makes turret lathe beds.**

Production executives wishing to keep abreast of **new equipment on the market** should turn to page 383 where 12 pages of shop equipment news begin. Thus far in 1938 American Machinist has published 31 percent more new tool descriptions than in the same period a year ago, and last year it led all other publications in its thorough coverage of such news.

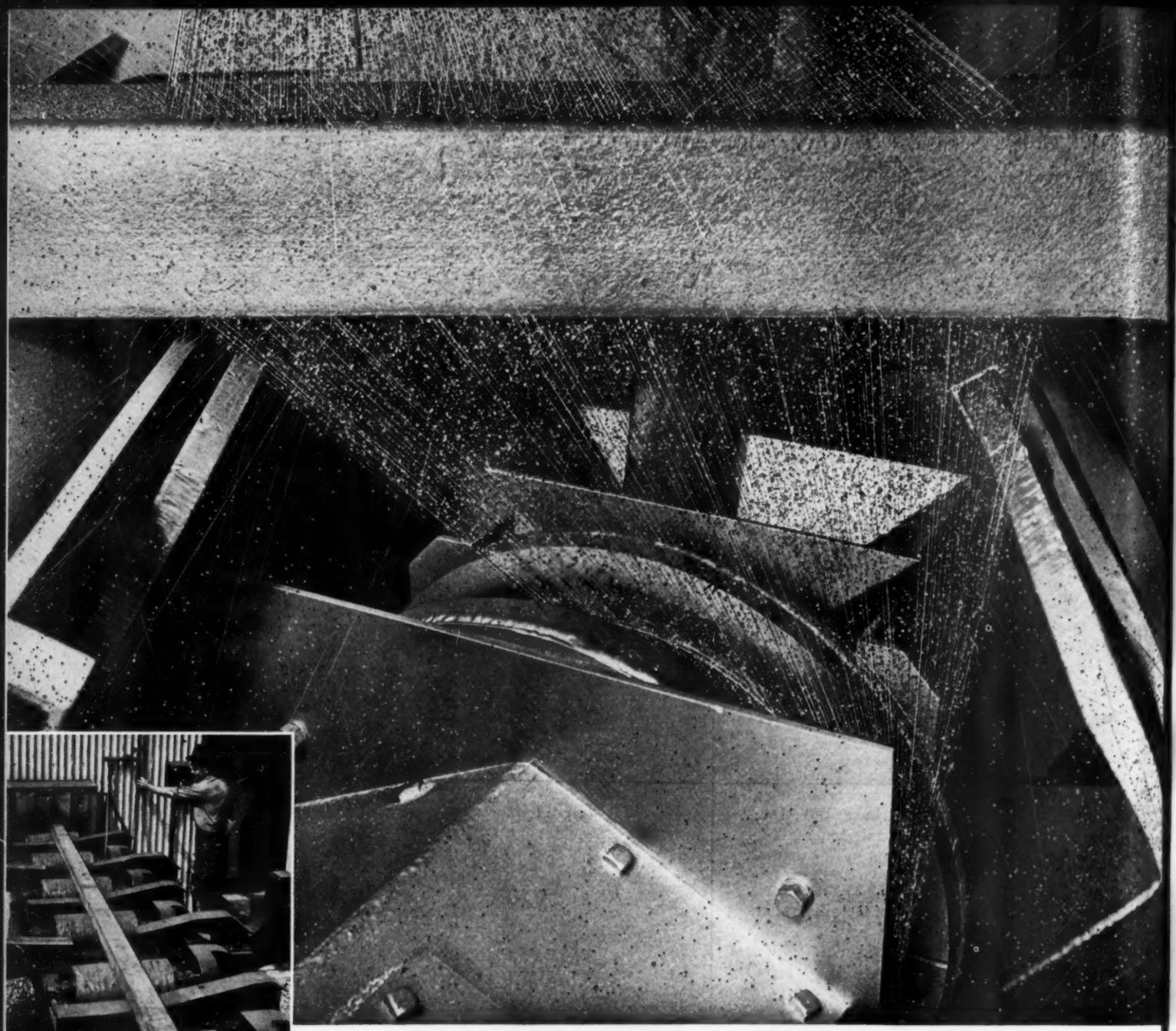
COMING



A ring gear is indexed by rope drive at the Watertown Arsenal

What are our army arsenals doing? To find that out for our readers one of our editors visited the Watertown arsenal. He found some of the work experimental and some more or less standard production to fill army orders. Much of it deals with special materials, usually of high hardness and toughness. Since the arsenal inaugurated a modernization program in 1934, part of the work is performed in the most modern manner, but other jobs must be improvised on old equipment. The lots are small and operations resemble those in a large jobbing shop. In a coming issue we shall bring you the details, together with excellent pictures, in an article "Work at Watertown."

What does heat-treating cost and how can it be figured? If costs are arrived at on a pound basis, the way is opened for glaring inaccuracies and costly losses. Parts of the same dimensions often differ widely in weight and furnace time required. Varying degrees of temperature to which different units must be heated adds to the complications of time estimates. A steel treating company has worked out a cost system which accurately determines where cost should be allocated.



Crushed steel shot, whirling at 130 miles per hour, thoroughly cleans off every trace of scale.

Billet, ready for cleaning, entering centrifugal shot-blast.

A LONG FORWARD STEP IN TOOL STEEL INSPECTION - -

cleaning tool steel billets and bars by centrifugal shot-blast

In keeping with this company's policy of utilizing every advance in steel-making practice and equipment to enhance the quality of Bethlehem Tool Steels, many grades of tool steel billets are now cleaned for inspection before annealing by a centrifugal shot-blast—a mechanically impelled tornado of sharp-edged steel shot, travelling at a velocity of approximately 130 miles per hour.

Three major advantages result from the use of this highly effective cleaning method in tool steel manufacture:

1. Billets are thoroughly cleaned before inspection so that injurious surface defects show up. This enables the inspector to reject any billet that does not fully measure up to the high established standards of quality.

2. Bars processed by this method are thoroughly cleaned prior to annealing—assurance of a surface free from defects which could be further aggravated in subsequent operations.

3. Shot-blasted bars, with their clean surfaces, eliminate cutting through hard and abrasive scale in the necessary machining of the finished bar.

Bethlehem makes a grade of tool steel for each of industry's tasks. Reference to the Bethlehem Tool Steel Guide will aid you in selecting the grade to best handle your specific job.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Taxes or Jobs?

REMEMBER only a few years back when we shook our heads as we read in the papers how every Britisher paid to the government in taxes about 25 cents out of every $1 of income? We thanked our lucky stars that we didn't live in England and didn't have to pay so much of our income to the government.

Well, the evil day that overtook England some time ago seems to have caught up with us. The United States Chamber of Commerce estimates that one-fifth of our national income goes to the payment of national, State and local taxes. Mr. Average Citizen may think himself fortunate because his income tax is relatively small; he isn't aware of the large share of his cash outgo that is painlessly extracted from him by governmental units. These hidden taxes are neatly covered up in the paying process.

But let's forget momentarily about hidden taxes and view only those out in the open. And let's pass from Mr. Average Citizen to business and industry. How are they feeling the tax load piled on them by a national administration trying to spend its way out of depression and by local governments which, so far as spending programs are concerned, are satellites of the New Deal?

General Motors Corporation last year paid $104,959,000 to various taxing authorities, which is in alarming contrast with $63,150,000 in 1935. Based on the average number of employees on the payroll during 1937, the tax bill was $444 per employee. That amount includes *only taxes definitely ascertainable.*

The American Rolling Mill Company reports that its taxes last year were equal to $1.20 a share on its common stock or 10 cents for every $1 paid in wages and salaries. Another large manufacturer says that his taxes have increased 600 per cent in the last three years, the extra taxes being equal to employment of 6500 additional workers for one year. Still another company pays taxes equivalent to $1.15 each working day for each wage earner on its payroll.

Fortunately signs are appearing that the country is pretty well fed up with the government's "easy spending" policy. The proposal that Uncle Sam go on another spending spree hasn't aroused noticeable enthusiasm and most people, including the New Dealers themselves, have their fingers crossed as to its success. Even more to the point, the House and Senate finally have agreed on a compromise tax measure which substantially modifies the undistributed profits tax and the capital gains tax.

BUT THIS is not enough. If we are to get back onto a safe and sane financial policy and keep the tax burden on industry (not to speak of Mr. Average Citizen) within reasonable bounds, we must put into public office officials who are more interested in saving the people money than in disbursing billions with a free hand. When industry sees some evidence of sanity in the nation's fiscal affairs, that in itself will go a long way toward restoring the lost confidence which people lately have been talking about so much.

Gaging Business

SENTIMENT in the metal-working industries has drooped a bit. No immediate improvement is looked for and most companies are putting their faith in a fall upturn. In fact, several important concerns have asked employees to complete vacations by August 1 because expanded operations are expected then. Machinery builders continue to derive their major support from foreign armament programs. Some firms with export orders are booked ahead for many months. Poor domestic sales, however, drag down badly average operations for the industry.

Agricultural implement and tractor makers are going well, but signs of a seasonal tapering are apparent. Steel operations at 30.7%, reflect a drop in sales from the March total. Motor car companies, resigned to a spring sales season far below normal, are concentrating attention on developing 1939 models. An unusually long summer shutdown for retooling looms. Hope of much railroad buying this year, raised by pending R.F.C. loans, appears to be fading. The electrical business is improving somewhat, though utility purchases continue slow. Engineering construction awards, bolstered by public works programs, promise substantial work in the coming months. Business Week's index of business activity is at 58.1 compared with 59.1 a month ago.

NEW ENGLAND—Thanks to purchases by Britain, Japan and Russia and to business placed by Ford, machinery orders in April held at the March level. One dealer reports the best volume since last June. Providence, R. I., trade schools have bought almost 100 light machine tools costing $30,000. Scattered inquiries come from the Newport torpedo station and Springfield armory. Makers of street and industrial lighting equipment report improved business; public institutions are buying a wide range of electrical apparatus. General industrial production remains subnormal.

SAN FRANCISCO—Industrial operations are down only 15% from last year, with aircraft and petroleum industries holding equal to or exceeding last year's production. Continued improvement in the building industry, with permit values at highest level since last July, is a bright spot. What had been hoped to be an upturn in machinery orders early in April has actually been a leveling off of the decline.

CINCINNATI—Mixed reports come from local machine tool builders, some of whom are busy on foreign orders. The majority, however, say that sales for export have tapered recently and domestic buying is not encouraging. Most companies are pinning their hopes on a fall pickup. There is a slight improvement in the supply trade.

CHICAGO — Implement and tractor production, though still strong, is starting to slip. Small agricultural tractors continue to do well, but large industrial tractors are selling slowly. Electrical apparatus makers are cutting operations. Steel rate is down again, though wire mills are at 60% and tin plate mills at 50%. Only railroad sheet steel buying has been alloy stock for light-weight cars. Sales of farm fences in the first quarter were almost equal to a year ago. Some machinery dealers say that April sales were slightly greater than the March volume.

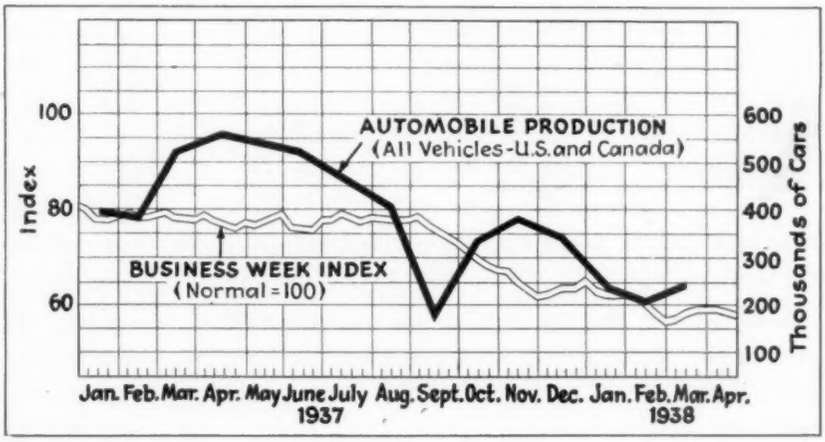
PITTSBURGH—The steel market is apathetic with operations at 30.7% or 4 points less than the March top figure. Most current orders are coming from miscellaneous sources. Local industrial production is at 56.7 compared with 59.3 the middle of April, according to Bureau of Business Research, University of Pittsburgh. A large steel company has instructed all employees to complete vacations by early summer, believing activities may expand in August. Sales of large standard machine tools made April the best month of the year for some dealers, but the first quarter was far below the same quarter of 1937.

CLEVELAND — Auto parts factories are running at a low rate, with no improvement in sight until the 1939 season starts. Steel mill schedules continue lean. Ore companies are reported commissioning about 25% of the boats used last year.

DETROIT — Equipment purchases have lagged. Small tool and supply trade reports a large number of orders, but the dollar volume is poor. Non-automotive companies, such as Burroughs and Kelvinator, are doing better than the motor car makers.

AUTOMOBILES VS. GENERAL BUSINESS

More closely attuned with the state of general business than in months, automobile output will probably remain stagnant for some time. No high pressure sales campaigns are under way in an attempt to alleviate the situation



DAD SAYS

You Got to Have Discipline in a Factory

MY DAUGHTER has two kids—one five and the other nine. She got married to one of the school teachers here and they have a lot of new-fangled ideas about raising kids. Every time I'm around with them I just get mad all over because those kids are never taught to mind anybody. They do anything they please and I know they are no happier than I was when I was a kid and I had to mind. Yes, and that's what's wrong with a lot of things today.

Now, take the shop for example. Years ago, before we had all this union business, when the boss told you to do something, you just naturally did it. But now, if a fellow doesn't want to do it he goes and gets his steward and they go up to the office and argue about it—just like my grandkids do.

Of course, I know that sometimes the foremans were pretty hard-boiled, but anyhow they kept the plant running like clock work. Now you can just see that it's not running like it used to. It's getting all sloppy, like, and the men don't like it any better than I do. Every man likes a boss who is a boss, one who can tell a fellow to do a job in such a way that he will do it and like it.

But as I see it, that's not the worst thing. The real trouble is that it must be costing the company a lot more to make things now than it did in the old days. Any man ought to be able to figure out that if we can't make the stuff as cheap as someone else, why we can't sell it. This lack of discipline must have raised costs a lot, and I'd be willing to bet that's one reason why we're only working two or three days a week now.

The inspiration for these little sketches comes from "Dad" who works in the Maintenance Department of a large factory. "Dad" is a workman in his early sixties. He is "Dad" to all the men. He is their father confessor, their counselor and, at times, their banker. His views reflect fifty years of hard work and keen observation. His practical philosophy gives no clue to the fact that his formal education ended at the third grade. In discussions and arguments around the plant "Dad" is often quoted.

The Machine Tool In a National Emergency

Modern manufacturing equipment is essential to preparedness because the demands that will be made on the production facilities of the country, human and mechanical, will be too much for obsolete machines to handle

HOWARD W. DUNBAR
President, National Machine Tool Builders' Association

WE ARE ALL familiar with the higher wages, shorter hours and enrichment of everyday human life that has resulted from the mechanization of industry. I venture to suggest that the replacement of obsolete machine tools can yield equally fundamental benefits to the armed forces of this country.

HOWARD W. DUNBAR

It is hardly necessary for me to point out the extreme importance of the machine tool industry in time of national emergency. As soon as we start to assemble an army we must clothe it, thereby throwing an additional burden on textile mills and the clothing factories. When they need additional manufacturing equipment it must be manufactured on machine tools. Modern war depends more and more on the products of the machine for the equipment needed, the munitions and transportation. The tendency in every kind of manufacturing is to work to extremely close limits of accuracy that involves not only the use of machine tools, but of modern machine tools. It would be difficult, if not impossible, to secure the necessary accuracies in production quantities on machine tools that have been in use for ten or fifteen years. They were not built to manufacture to modern standards, in which there has been a tremendous advance in the last few years. Also, while they may still be in operating condition, wear and tear has naturally affected the accuracy of their output.

According to the 1935 study of obsolescence in the metal-working industry made by American Machinist, 65 per cent of the machine tools in use in this country then were more than ten years old. A recent study by the office of the National Machine Tool Builders' Association indicates that this percentage has not been appreciably reduced since 1935.

A given design of machine tool remains standard for approximately seven years. This period is subject to considerable variation, of course, but if a production machine has been in use for more than seven years, it is a safe guess that a better machine has been developed and introduced to the market to do that particular type of work. The average age of machine tools in use in government arsenals, shops and navy yards is a great deal longer than ten years, and the percentage of obsolescence in government establishments is, therefore, much higher than 65 per cent. This is an extremely serious problem for which some solution must be found, unless we are deliberately to take serious risks by neglecting a link of critical importance in our national defense.

The machine tool industry, elastic though its capacity may be, is not one which can double its output on short notice because it must have a certain type of skilled man and must be equipped with accurate machine tools for him to use. It would be impossible, in case of national emergency, for the machine tool industry suddenly to replace the obsolete equipment in government establishments, and at the same time meet its own requirements and those of many other industries whose output would have to be substantially

increased at precisely the same time.

There is the further consideration that workmen in government establishments would have to go through a preliminary period of training before they learned how to handle the new machine tools to the best advantage. The supply of trained mechanics is extremely limited, and if the machine tool industry is called upon to supply them, its own efforts will be correspondingly handicapped.

While we still have time to prepare ourselves for any emergency that may arise, I believe that it would be highly advisable for us to study the relative merits of single purpose and general purpose machine tools. Those responsible for ordnance production and manufacture probably have definite ideas of the quantity required of each item that will have to be manufactured on machine tools. Knowing that quantity, the next step is to lay out the machine required to supply it at the required rate. It seems to me that one complete unit at least should then be installed and operated in some government establishment to check the soundness of this part of the plan. The question as to whether to buy a single purpose or a general purpose machine will almost be answered automatically, for the primary problem is maximum production with minimum direct labor.

Another factor that must be allowed for is that because of the accurracy of workmanship required it is difficult if not impossible to adapt facilities not ordinarily used for that purpose, to the manufacture of machine tools. An emergency will overload all our facilities for metal working in every field. This happened in the last war and the attempt was made to meet it by sub-contracting of parts and assemblies. In few cases was this method satisfactory.

Standard Tools Preferable

Our experiences in the previous emergency should have taught us the undesirability of buying other than standard machine tools without gadgets. There is such a wide variety of machines available today that most of the emergency needs can be met without designing any special machine provided the standard machines are equipped with proper tooling and attachments. I believe it is a mistake for government engineers to try to redesign machine tools by specifying how large certain shafts may be and of what material they should be made. We should have learned by this time that in case of war the suppliers of machinery will not even have time to read such specifications, let alone trying to meet them. The industry has found it satisfactory to hold the machinery builder responsible for the performance of his products. There is no reason why the government should not have the same success.

Modern high powered artillery can be built only on modern accurate machine tools

There are certain other things that might be done to insure adequate manufacturing capacity and efficiency in time of emergency. One of them is the part that transportation will play in a national emergency. Railroads should be encouraged to recognize the importance of the movement of machine tools to points of designation and there should be facilities to equalize delivery costs. Since a tremendously heavy load will be put upon the railroads, steps should be taken as soon as possible to modernize the equipment in railroad shops which is today so inadequate.

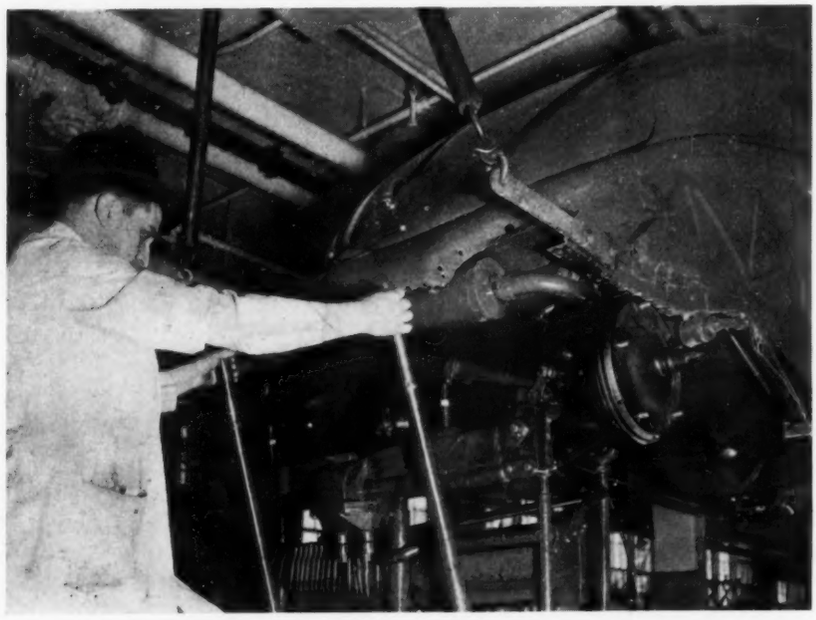
Our small force of trained ordnance engineers can hardly hope to handle the huge and complicated problem of selecting equipment for arsenals, field bases and factories. A planning board, under government supervision, of course, should be made up of skilled engineers selected from the machine tool industry to aid in this task.

All articles to be manufactured should be planned with the same degree and attention that they would get in a factory which must show a profit. Each operation should be laid out and the very best of tools, jigs, fixtures and machines provided for that operation, depending of course, upon the quantities to be produced and the accuracy desired.

Specifications covering the purchasing of equipment should be so simplified as to allow for the selection of the best machine for the job. It matters little whether a particular shaft in a machine is 1.75 in. in diameter or 1.70 in. in diameter, or whether some unimportant part is made of 0.30 carbon steel or 0.40 carbon steel. Too often specifications are written around some machine manufactured by a particular concern with no particular reason for so doing. This practice obviously limits the sources of supply.

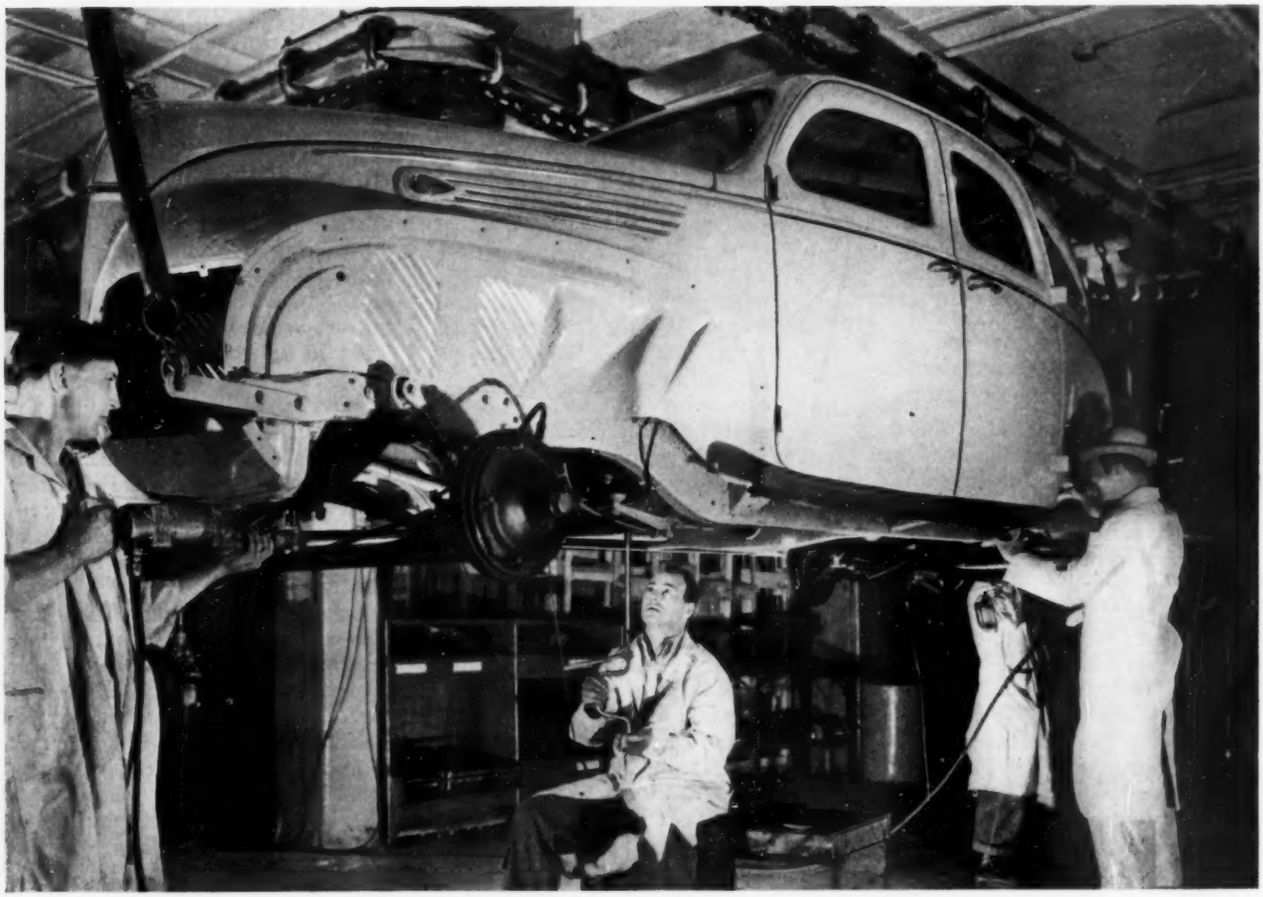
Finally, some better method of training skilled machinists in greater numbers and at greater speed must be devised. We found out as we came out of the last depression that there was a shortage of skilled men. That shortage would be seriously aggravated in case of a national emergency. The far-sighted training and use of man power is the greatest problem before the nation today.

Lincoln-Zephyr

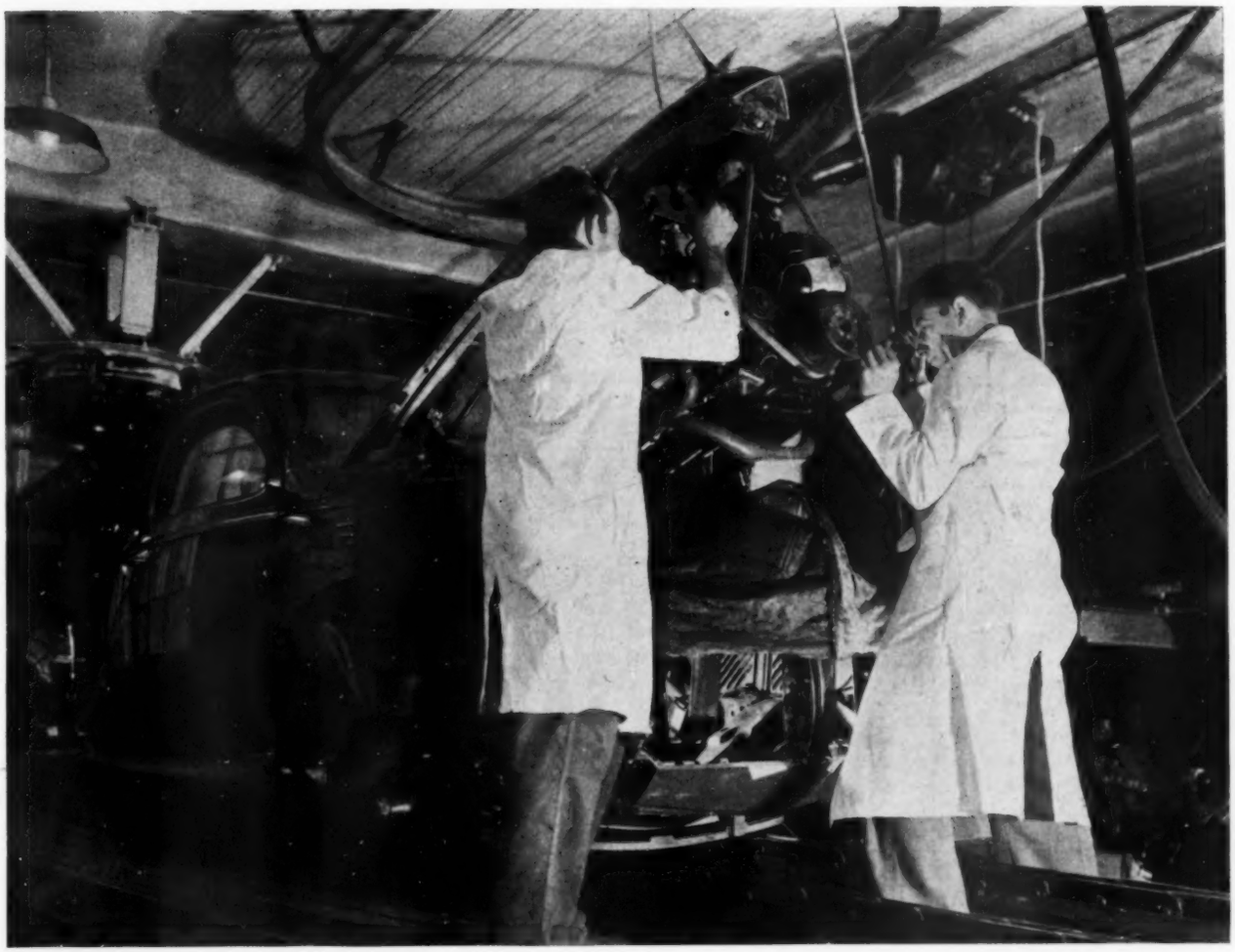


Where body and frame are integral, as in the Lincoln-Zephyr design, assembly practices must differ from those for conventional cars. Bodies are trucked into the assembly plant and go through cleaning, spraying and baking operations. Then instead of lowering the bodies onto an assembled chassis moving along the floor conveyor, they are suspended from an overhead conveyor so that the axles and other running gear can be installed from underneath. Special lift trucks support the axles while they are bolted in place

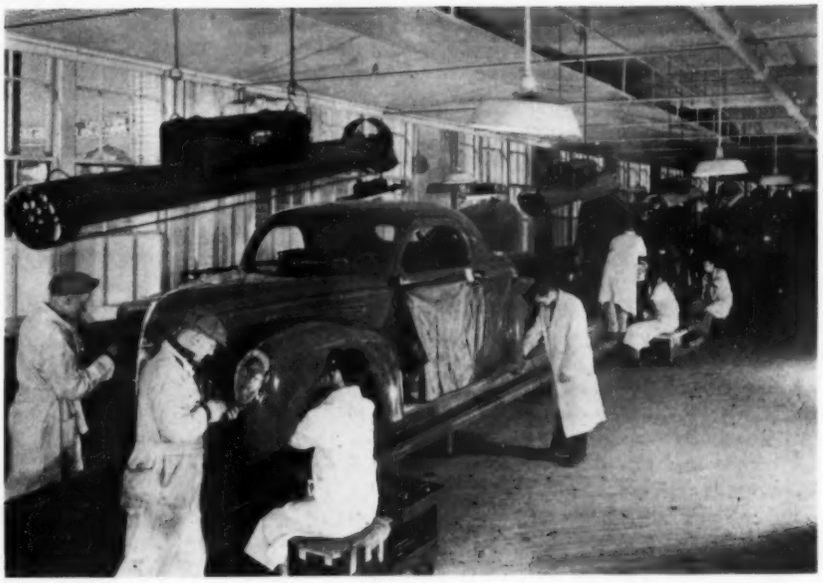
Tools such as the angle-head nut runner allow the men to work in comfortable positions under the body. When all the running gear is installed, the body is lowered to a floor conveyor for installation of the motor



Unit-Body Assembly



Placing the motor in the front end, under the hood, requires careful handling, as the alligator hood is already in place. The motor is hung on a special gooseneck lift-hook. Even with this special handling equipment, care must be taken to get just the right lift and the proper movement to slide the motor under the hood



Final adjustments are made, and the grilles, lamps and sundry parts are put in place while the car is moving along the conveyor. Excellent lighting, both natural and artificial, prevails throughout this department

Railroad Press Fits

Interference is not the only factor to be considered when a wheel is pressed on an axle

FRED H. COLVIN

PRESS FITS, which are used in such widely varying fields as watches and locomotives, involve a greater number of factors than is always realized. Among these are:

1. Material of the mating parts.
2. Diameter and length of the mating surfaces.
3. Difference in diameter, or interference.
4. Amount of material around the hub or hole.
5. Thickness of wall if axle or shaft is hollow; this need be considered only when the wall thickness is small in proportion to the diameter. Its practical application is confined to thin tubes and bushings.
6. Quality, or condition of the surfaces in contact.
7. Kind of lubricant used.
8. Amount of pressure used in forcing parts together.
9. Distortion of mating parts due to pressure.
10. Pressure required to remove axle or shaft.

The weakening of a locomotive axle, for example, which has been brought out forcibly by recent experiences and from carefully conducted tests, can be considered under the heading of distortion, or of the material itself.

Perhaps the main factor, in the eyes of those making press fits, is the difference in diameter, or the amount of interference in the mating parts. There are, however, other factors which seem of at least equal importance. Among these are the elasticity of the material, the length of the fit as compared with the diameter, the roundness of both parts and the quality of the surface. Of these, the last two seldom receive the attention they deserve. This is because we are likely to consider all turned and bored surfaces as being round, and we do not yet appreciate the importance of the surface quality. This is probably because we have no recognized method of measuring surface quality, and no standards except visual comparison.

As a matter of fact, perfectly round axles and holes are extremely rare, and this lack of concentricity causes unequal distortion when the parts are forced together. With both members perfectly round, the distortion caused by forcing an axle into a hole smaller than itself is equally distributed, where the metal in both parts is homogeneous. Careful measurements may show that, far from being perfect, neither member is round within easily measureable amounts. In addition to this, there is the probability that one or both members is tapered to some degree. Both of these factors account for the wide variations in the pressure required in making force or press fits with the axle and the hole presumably of the correct sizes. And many press fits have been made with both axle and bore machined in tools that were far from accurate. Then too, the mating parts have, in many cases, been measured with plain calipers instead of micrometers. The wonder is that fits made under these conditions have been as successful as experience has shown.

Rule-of-Thumb Fit

One-thousandth of an inch per inch of diameter has been a standard rule-of-thumb for many years. On many locomotive fits this allowance is sometimes multiplied by two or three, and in unusual cases, by four. On the other hand, there are cases, especially in larger diameters, where the allowance is less than 0.001 in. per in. Whatever the allowance is, it is much easier to specify it than it is to be sure you are getting the difference in diameter, or interference, that you desire. As before stated, both out of roundness and taper affect the actual interference appreciably, as well as the pressure required.

Many users of wheel presses do not seem to realize the amount of distortion that takes place, especially where heavy pressures are used, or how the parts, such as locomotive driving wheels which are held by heavy steel tires that are shrunk in place, are affected by this pressure.

It is frequently necessary to remove the tire before a crank-pin or axle can be pressed out of the wheel. It also makes a decided difference in the pressure required for both axles and crankpins whether or not the tire has been shrunk into place., The amount of "shrink" allowed on the tire may easily have a direct effect on the pressure required for mounting either the axle or crankpin, assuming that the tire has been put in place first. This being the case, it is reasonable to suppose that the shrinking on of a tire after the axle and pin are pressed in place, will have a decided effect on the stresses in the wheel which may in turn be transmitted to the axle itself. One effect of this may be to throw the crankpins out of square as is frequently done by the cocking of the pin in the wheel when it is being pressed into place. This misalignment has led to the practice of finish turning and rolling the crankpins after they are in position in the wheel.

Applications of roller bearings to locomotive and car axles have added to the importance of the whole question of press fits. This is because it is necessary that the inner roller race be free from distortion after it is pressed on the axle. Being of comparatively light section, it could easily be forced out of shape and anti-friction properties greatly impaired. This makes it necessary to have the axle fit which receives the race to be as round as possible. This factor has caused the introduction of

grinding machines as the finishing method, it being generally conceded that grinding gives a surface more nearly round than can be secured by turning.

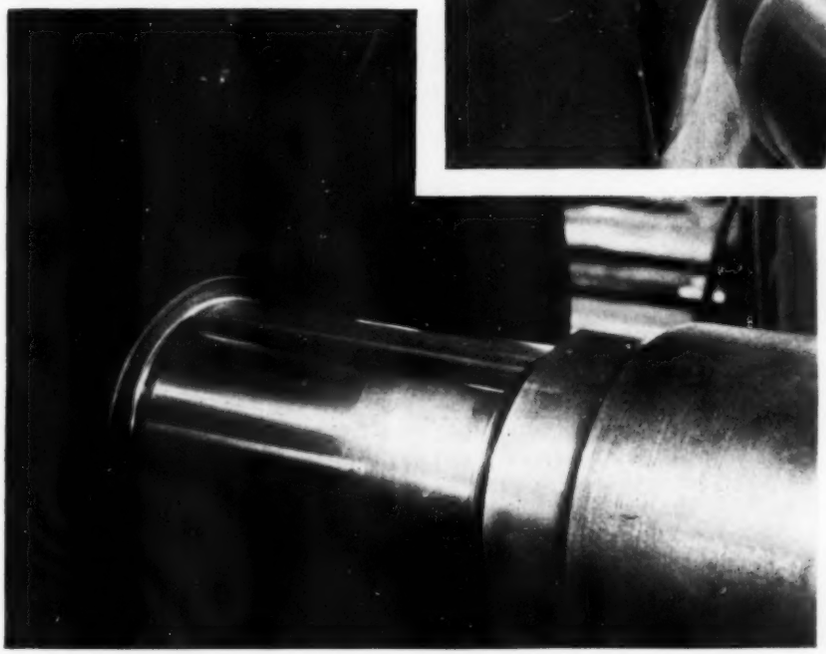
It is probable that this practice will be extended to include both wheel fit and journals for plain bearings as has been done in Great Britain and on the Continent for some time. This practice is now gaining favor in this country and should result in more uniform pressures and less distortion. This is because both diameters will be held more closely to size, the axles will be more nearly round and the surface will be of more uniform quality. This, according to the experience of some shops, will make it possible to press wheels on and off several times without any material variation in mounting pressure.

One effect of forcing wheels on axles has not always been appreciated. This is the weakening of the axle due to the press fit. Tests at the Timken Roller Bearing plant by T. V. Buckwalter and his assistants show that the strength of an axle of 0.45 per cent plain carbon steel is reduced from a normal of 34,000 lb. per sq.in. to about 14,000 lb. after the wheel is in place. Cold working by rolling the wheel seat with a pressure of 25,000 lb. per sq.in. more than doubles the strength of 14,000 lb. Other methods such as heat-treating grooves in the hub face or enlarged wheel seats do not appear to give more than a 10 to 25 per cent increase in strength.

In this connection it is interesting to note the effect of pressing on a wheel also cold works the surface to some extent. Tests at the Galesburg shops of the C.B. & Q. a few years ago indicated that the diameter of the axle was reduced from 0.001 to 0.003 in. by the pressure of the hub. This reduction, however, does not seem to have the same effect as rolling, possibly because forcing the wheel on the axle imposes longitudinal stresses that disturb the structure of the steel.

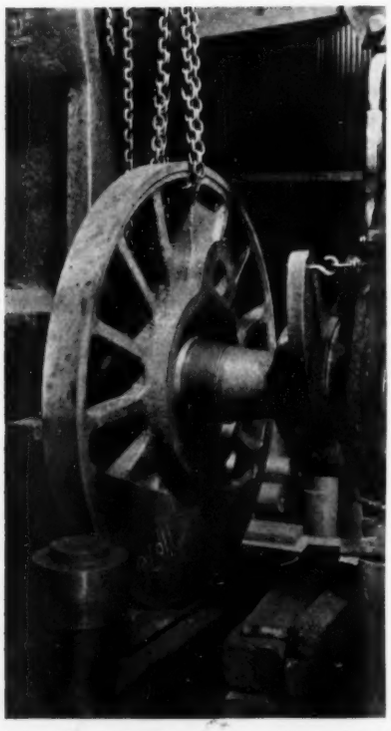
To those not familiar with press fits the kind of lubricant used may seem of minor importance. But practical shop men state that they can vary the amount of pressure required over a wide range by the use of different lubricants. This statement is borne out by the tests of the C.B. & Q. railroad and published (*AM*—Vol. 78, page 639) in an article on press fits. These tests were authorized by the Association of Manufacturers of Chilled Car Wheels. They also show that excessive fit allowance decreases the effectiveness of the fit. Wheel fits of 7 in. diameter with an interference of 0.033 in. required less pressure to remove than one with only 0.005 in. This smaller interference however, did not require the desired mounting pressure. The usual lubricants used consist of oil and white lead in widely varying proportions.

Accurate grinding to micrometer measurement gives close control of fit size. Norfolk & Western grinds axles twice, before and after rolling



An axle ground after rolling shows a low spot which indicates that concentricity is difficult to maintain when rolling under heavy pressure

The Norfolk & Western railroad is increasing the use of grinding in its Roanoke shop. In fact it grinds some parts, such as the wheel fit of axles, twice. The first grind after turning leaves the axles from 0.010 to 0.012 in. larger than the final press fit size. The axle is then rolled with a pressure of 25,000 lb. per sq.in. and finally reground to a diameter which is from 0.018 to



The Roanoke shop uses a plug with a slight taper for burnishing the bore of the wheel before assembly to the axle

0.22 larger than the wheel bore.

The second grinding operation was adopted because of noticeable irregularities in the axle surface after rolling. This bears out the experience of others who, although they do not grind, admit variations up to 0.005 in. in concentricity. The rolling under heavy pressure is to counteract the weakening effect of forcing the axle into the hub of the wheel.

The Roanoke shop also forces a hardened steel plug through the bore of the hub before mounting the bore. This irons out any inequality in the bore, or burnishes the surface and also work hardens the surface. The plug is from 0.028 to 0.030 in. larger than the bore and from 100 to 150 tons is usually required to force it through. The hub is found to have taken a set, or been enlarged, from 0.005 to 0.010 in. by this method. The axles are also ground to a slight taper of from 0.008 to 0.010 in. in the length of 8 in. With this taper, and the amount of interference given (0.018 to 0.022 in.) the mounting pressure runs from 170 to 200 tons. For main drivers the practice is to use the upper limits of pressure, or even more. Applications of sand when a locomotive is slipping its wheels badly, plays hob with wheel fits.

Some other roads also use a slight taper. On the Southern Pacific railroad this is less than 0.001 per inch of length. Another method of obtaining a similar result is that of the Boston & Maine railroad. It leaves the inner end of the wheel fit about 0.005 in. for a distance of 1½ in. This enlarged diameter is to make up for any enlarging of the wheel hub at the entering end, either by stretching or broaching action.

One student of the subject suggests that the reason for the taper is to be sure that it does not *taper the wrong way*. While this might have been the case when measurements were taken less carefully than at present, it hardly applies to such shops as those mentioned.

A study of the pressures given in various tables for mounting wheels on axles and similar parts shows wide discrepancies and tolerances. Some of the differences are caused by materials used and to the requirements of the fit. The amount of metal around the hole into which the shaft is pressed naturally has an effect on the pressure as even large masses of metal stretch under pressure.

A 7-in. fit in cast iron wheels varies from a minimum of 45 to 63 tons and a maximum of 60 to 77 tons on the same railroad. In steel wheels the minimum pressures are from 73 to 104 tons and maximum pressures from 90 to 133 tons. These fits include driving wheel axles, crankpins, locomotive and car trucks. The wide tolerances permitted in the fit pressures are from 11 to 35 tons, seemingly a very wide range. With fairly close tolerances on the fit diameters, probably both the quality of the mating surfaces and the lubricant used play a large part. It will also be noted that the pressure per inch of diameter varies widely from the fairly well established rule of from 10 to 15 tons per in.

Extensive experiments by a German engineer, G. Schmaltz, and recorded in his book on the subject, show very clearly the effect of surface finish, or quality, on the pressure required and the tightness of the fit. One of his tables includes a "smoothing factor" which represents the minimum interference that should be applied to a press fit. This smoothing action tends to make a good contact between the mating surfaces.

Greater interference creates strains in the inner and outer surfaces. Excessive interference serves no useful purpose as it leads to the pressing out of material by the end face of the internal part, or the shaving of the shaft by a sharp edge on the external member.

These experiments emphasize the necessity of having surfaces of known quality as well as holes and shafts that are round and of correct size. Variations in any of these factors have a direct effect on the kind of fit to be obtained.

Buy—Don't Bribe

CHESTER FRANKLIN

Having had experience with many methods of wage payment I was much interested in the article by A. L. De Leeuw, "Buy — Don't Bribe" (*AM*—Vol. 82, page 223). He states the case fairly for all the wage payment systems mentioned. But I cannot see how his bonus plan is any more a *definite contract plan* than straight piecework.

He says of his bonus plan, "It permits the employer to change the contract price, but only when some new condition has arisen, such as new tools or machines, and then only to the extent that the contract time has been affected by such a change." The same conditions applied to piecework would make it just as flexible and much more simple to operate. The great objection to piecework was that these conditions were not observed, as Mr. De Leeuw himself points out. He truly says "greed spoiled the system." Why should it be different with the bonus than with piecework?

I once asked an advocate of the Halsey premium plan how he cut times that had been set too high. He admitted that they changed the shape of the lathe tool and called it a new method. It didn't fool the men any more than it did the boss, but was a sort of "face-saving" gesture. How will Mr. De Leeuw prevent this with his bonus plan?

I heartily approve of his giving the man freedom to use his own method instead of the standard if he can produce as much as by following the instruction sheet. One of the great weaknesses of the Taylor group was that they insisted that all wisdom was vested in the planning department. It not only missed many valuable ideas, but it killed any initiative on the part of the men and aroused antagonism.

Errors in Wire Measurement

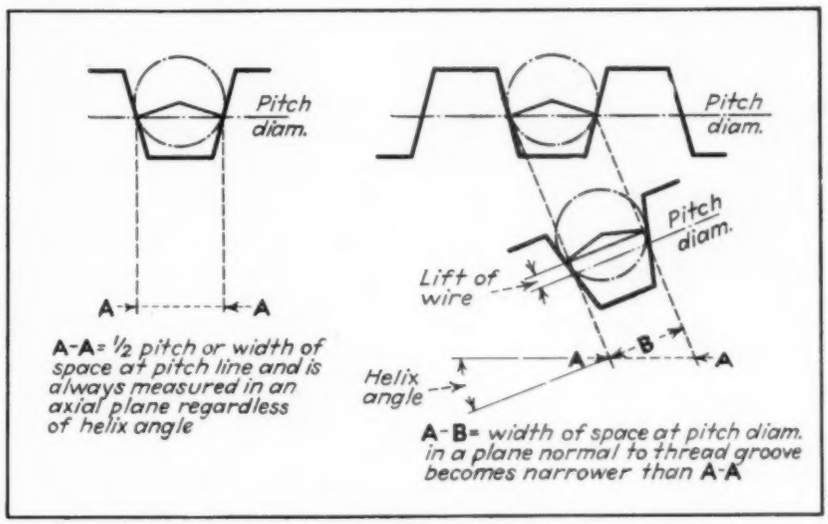
When the lead is great, as with Acme or multiple V threads, consideration of the helix angle should be included when measuring by the wire method

OSCAR E. KOEHLER
Chief Engineer, Greenfield Tap & Die Corporation

WIRE MEASUREMENTS have their place in checking thread sizes, but unless they are used carefully they may cause trouble. For example, a manufacturer recently ordered a tap for some brass nuts to fit a double Acme thread. He inspected his threads according to a standard table of wire measurements and was greatly surprised that the nuts were eight thousandths loose.

What happened, and what may happen in other cases, is that the table used gave the measurement over wires for the normal thread, neglecting to make any reference to the error caused by the helix angle. Such tables can be used on standard V-threads when the lead is small, because in such cases the correction may not be needed. However, for Acme threads the error is greater for the same pitch, and if the lead is of any considerable size such as when a double or triple thread is used, the helix angle correction must by all means be considered.

The accompanying sketches demonstrate the need for this correction. That at the left shows a wire or pin as it would rest in the tooth space were the normal profile only considered. When a wire or pin is placed on a screw thread, however, it lies along the helix and takes a position such as is shown graphically in the sketch at the right. Projecting the tooth space in the direction of the helix angle shows that the tooth flanks are distorted, in effect giving a narrower space with a steeper angle. A wire or pin which will rest on the pitch diameter in its normal position will ride higher in the space in proportion to the cosine of the helix angle. If the measurement is taken ignoring this change, the screw will be turned too small, and where conditions are bad, may have to be scrapped.


Pitch diam.
A
A
A-A = ½ pitch or width of space at pitch line and is always measured in an axial plane regardless of helix angle
Pitch diam.
Pitch diam.
Lift of wire
A
B
A
Helix angle
A-B = width of space at pitch diam. in a plane normal to thread groove becomes narrower than A-A

Projected views of the normal thread and that in the direction of the helix demonstrate the difference in wire height

---

Pump Motors — Now under construction at the Westinghouse East Pittsburgh Works are the six largest motors ever built for pump drive. They are for pumping stations of the Metropolitan Water District of Southern California.

The motors rated at 12,500 hp. at 6900 volts 3-phase, 60 cycle operate at 450 r.p.m. with air coolers for self ventilation. They are equipped with exciters and pilot exciters and will drive single stage centrifugal pumps rated at 220 cu. ft. per sec. against a 440 ft. head. The pumps, also the largest of their type, were constructed by the Worthington Pump and Machinery Corporation

Landing Gear Forks Welded at Glenn L. Martin

Great care is essential in the welding, heat-treating and machining of these vital aircraft components, which are made of tough alloy steel

H. R. LEGRAND
Assistant Editor, American Machinist

TWO HALF FORKS, one for each wheel, are used in the retractable landing gear of bombers built by the Glenn L. Martin Company. Each fork supports a jumbo-tired wheel and its hydraulic brake mechanism by means of a stub axle fitted to the lower bushing. The top bushing of the fork receives an oleo-type shock absorber which is connected to the center wing section.

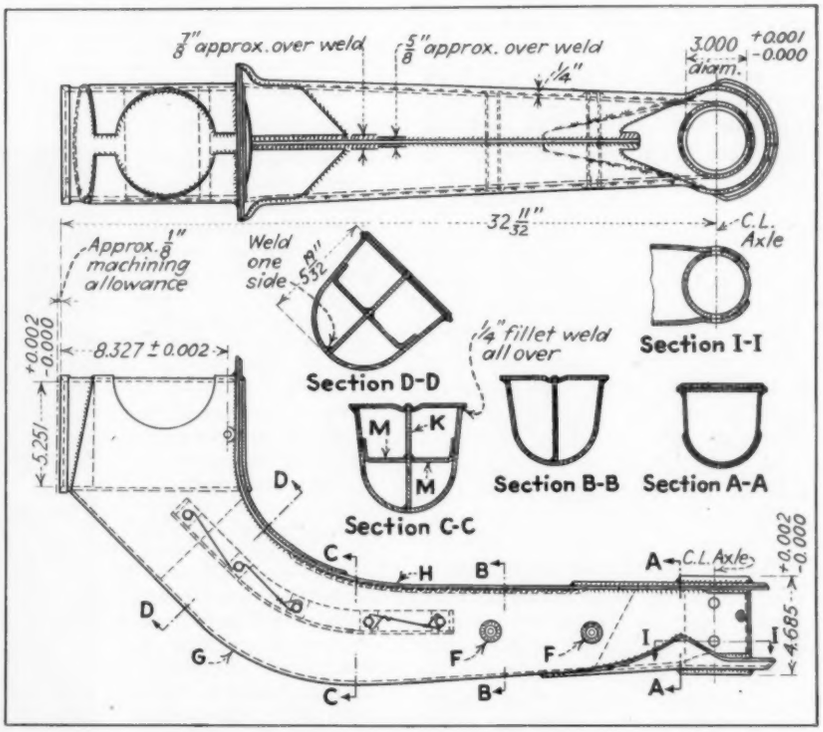
When a fully loaded Martin bomber is standing on the field, the dead weight supported by each fork is 5,600 lb. Impact load on the fork is high and during normal landing will probably amount to 30,700 lb. Obviously the forks must be made amply strong for such service conditions, but the problem of manufacture is complicated by the ever-present demand for lightness in all aircraft components.

Martin has solved the problem by utilizing a composite construction involving stampings and seamless-steel bushings. All parts are assembled by welding which is carefully controlled with regard to shrinkage allowances. Heat-treating involves securing physical properties of 180,000 per sq. in. tensile strength, and a Rockwell C scale hardness of 40. Boring the upper and lower bushings on a radial drill press is done to limits of plus 0.002 in. minus nothing on one and plus 0.001 in. minus nothing on the other. Grinding or reaming are not required to attain these tolerances. Material employed throughout is S.A.E. 4130 steel. Stamped components are 0.109 in. thick.

As will be seen from the drawing, the assembly consists of the deep-drawn shell *G*, the inner curved plate *H* that closes the open side of the shell, a lengthwise internal stiffening gusset *K*, two internal gussets *M* that connect the stiffening gusset with the side walls of the fork, the two bushings, two small formed stiffening gussets supporting the ends of the shell, one near each bushing, and two ski bosses, *F*.

Stampings are produced on a 500-ton Baldwin-Southwark hydraulic press, using simple cast-iron dies. Production of landing gear forks is done in small lots of 50 to 100 at a time, and the cost of all such tools must be absorbed on the initial order. Tools in use for drawing the shell involve a simple deep-drawing die with hand clamping by setscrews to draw the form, and a re-striking die to straighten the side walls.

Trimming the shell is done by placing it in a master form and



Several stampings and two seamless-steel bushings, all made of SAE 4130, are assembled by welding, in which shrinkage must be controlled

Left. **Each half fork must be light and yet amply strong to withstand severe landing loads and to preserve accurate running alignment of the jumbo-tired wheel.** ***Right.*** **At this stage in assembly, the operator applies a fixture to hold the raw edges of the shell and the central stiffening member in correct alignment and spacing, while the crosswise stiffening pieces are installed and tack welded in place**

nibbling the outline in a simple die set placed in a 5-ton Niagara press. The nibbling punch is ground back on the end to leave an eccentric tip that actually does the nibbling, while the larger body of the tool always bears on the edge of the master form. The nibbling press operates at 120 strokes per minute. Production might be considered slow on this operation, but the number of pieces does not warrant more expensive tooling.

Stampings are delivered to the welding shop for fitting, assembling in fixtures, tack welding, finish welding, inspection, heat-treating and layout for machining. Rough machined bushings are delivered to the same location by the machine shop.

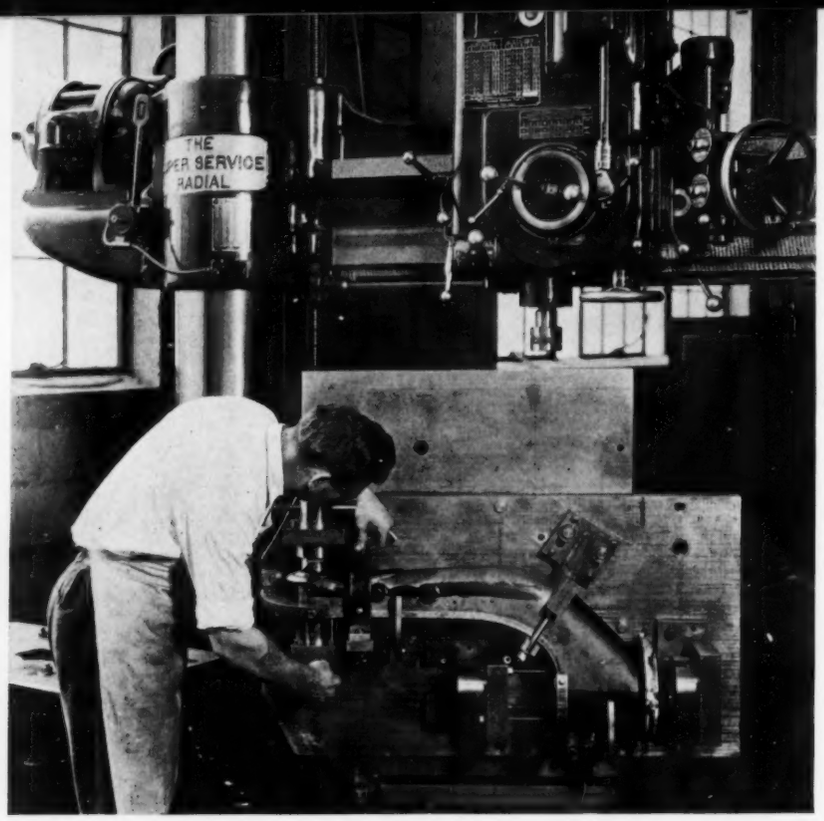
Initial steps in the welding shop prepare the shell and its formed closing strip for assembly in a tack welding fixture.

Consider the shell first. It is placed in a master templet and the outline of the templet is scribed on the shell. Excess metal is removed on a floorstand grinder and the part is then returned to the bench. Here the lengthwise center stiffener *C* is placed in the shell and located by a sheet metal gage consisting of two sheet steel pieces connected by two straps and contoured to the shell at sections *B-B* and *C-C*. A lug on the gage half at section *C-C* is contoured to fit the radius set in the bottom of the shell between sections *C-C* and *D-D*. Central slots in each gaging element hold the stiffener upright while it is tack welded in ten places about $1\frac{1}{2}$ in. apart. The center plate is then welded. A bead is run one-third the way from one end, the next third is done on the opposite side and the final third is made on the original side. Distortion is minimized by welding on alternate sides.

For locating the two gussets *D*, another templet is laid on top of the shell. This templet has V-grooves that engage the two raw edges of the shell and the top edge of the center plate. The two gussets are slipped in place after being fitted where necessary. Since the two end lugs on the gussets have been drilled and tapped, and since the five bolt holes in the shell on each side have been drilled with a templet, it is an easy matter to align and bolt up the two end lugs, tack weld the gussets to the center plate, and finish weld the gussets to the center plate. All welding is again done in one direction to minimize distortion. The part is inspected all over, particularly on the inside for defects in the welds or gussets.

The formed plate *H*, which closes the shell opening, is now scribed with a templet and ground to outline. The part is then taken to the assembly jig and located with the large hole over a plug which is the reference point. The small bushing for the stub axle is dropped in place at the other end. Note that the small bushing end of the fixture is elevated $\frac{9}{16}$ in. and that the bushing is located $\frac{7}{16}$ in. long to allow for shrinkage in welding. The legs of the assembly tend to close in from distortion by welding and relief of stresses during heat-treating.

The shell with internal stiffeners in place is then laid in position on top of the formed strip and fastened securely by small clamps along the edges and the two large clamps over the back. Careful fitting is demanded here so that the shell and plate will have a close joint. Tack welding is done every 2 in. along the joint of the shell and plate, and shell and plate to the small bushing. The work is then taken to the bench for complete welding of the seams, small bushing to both members, and



After heat-treatment, the fork is laid out for boring the bushings. Here the operator of a radial drill is setting up the piece in a trunnion jig, and is using plugs in the boring-bar bushings to center the tools on the scribed circles on the bushing faces

center stiffening plate to the formed plate where the stiffener protrudes through the slot in the latter. The stiffener is welded first to prevent distortion and shrinkage stresses that might arise if the other seams were welded first.

The assembly is brought back to the fixture for tack welding the large bushing in place. The plug that acts as a reference point for the large hole in the formed backing plate now holds the inner end of the large bushing. A removable end locating plate with four pins centers the other end of the bushing which is tack welded in place. The assembly is now removed to a surface plate where two inspection fixtures determine whether the shrinkage allowance has so far been taken up satisfactorily. At this stage the piece must have the axle bushing $\frac{5}{32}$ in. too long. If this condition is met, the large bushing is finish welded in place and the two outer stiffening gussets are also welded in place.

The assembly is now returned to the inspection fixtures where a working point is prick punched on the shell over the side of the small bushing and at a definite height location. The assembly is held by arbors on the inspection fixtures. The working point is set in a definite location and the shell is raised $\frac{1}{8}$ in. to allow for shrinkage. A drilling templet is then applied to drill the holes for the ski bosses, *F*. These are plugs which are driven in the holes and welded all around.

Normalizing is done at 1575 F., 1 hr. to get the heat and 15 min. at heat, in a Hevi-Duty furnace. Sand blasting and Magnafluxing to detect cracks or flaws precede return of the assembly to the checking fixtures. The height and length should now be about $\frac{1}{8}$ in. too great. If not, the shell is heated and the small bushing end is raised with a jack.

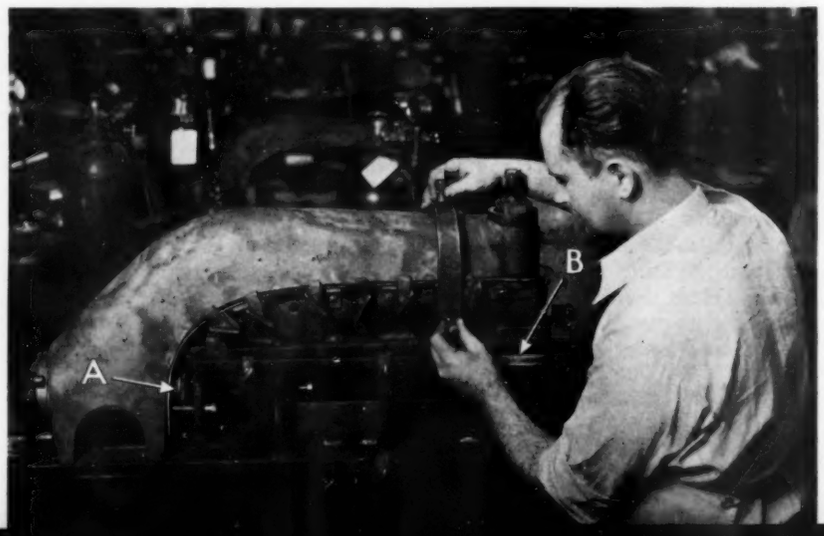
The normalized assembly is put back in the furnace for 1 hr. and 15 min., 1 hr. to get the heat, and 15 min. for soaking, and is then quenched in oil. Cleaning in caustic solution removes the oil and the part is then drawn at 800 F. for $1\frac{1}{2}$ hr. to achieve the tensile strength of 180,000 per sq. in. and a hardness of 40 Rockwell C scale. Sand blasting and Magnafluxing are again used to detect cracks or flaws.

Two test coupons go through the heat-treat with each landing gear fork to check the physical properties of the part and to check each other.

The welded and heat-treated assembly is then returned to inspection for a complete layout prior to machining. Boring and drilling operations are done entirely on two radial drills. So far the quantity of work has not justified use of horizontal boring machines. An indexing jig is used for boring the internal diameter, facing the end, and chamfering the two bushings. The fixture rotates on a central plug and is located by an indexing pin and bolts. The large bushing is bored to + 0.002 in. — 0.000 in. and the fixture is indexed to bore the small bushing to + 0.001 in., — 0.000 in. Reaming and grinding are not necessary to achieve these tolerances. The boring bars are supported in very heavy bushings and the machine is run at 18 r.p.m. for the large bushing and 24 r.p.m. for the small bushing. Machining time for this part is $7\frac{1}{2}$ hr. floor to floor because of the extremely accurate set-up required.

The fork is then transferred to another radial drill fitted with a trunnion-type jig where the ski bosses are spot faced and drilled and the numerous small holes in the sides are drilled. Complete inspection follows with an axle in place. Cleaning and cadmium plating complete the operation on the landing gear fork.

An assembly fixture is used first (as shown) to tack weld the shell and closing strip together, and later to tack weld the large bushing in place to the otherwise completed fork. A plug at *A* holds the inner end of the dummy bushing and is the reference point in the fixture. The top half of the fixture is tilted up as at *B*, so that allowance is made for the drawing down of the assembly during bench welding and heat-treating



Holes in Hardened Tool Steel

Grinding without annealing may be slow but it avoids all chance of distortion

WALTER KASSEBOHM
Superintendent of Tool Division
Marchant Calculating Machine Company

IN THE MANUFACTURING of stampings, the tool room is often required to make changes on dies after they are completed. A well known way of adding unanticipated machine work to a hardened die block is to anneal the die block, do the necessary work and re-harden the tool steel as required.

If the die block is of an intricate shape, this method is not recommended since distortion will occur during the annealing and re-hardening process. This distortion might make the die block unfit for future use, especially when the die is to produce parts which are required to stay within close dimensions.

If, for instance, additional holes are required in a solid and hardened tool-steel die block, which cannot be annealed for the above mentioned reasons, a unique method of grinding holes in the solid and hardened tool steel can be applied. Even though such a method is a comparatively slow process, it has the great advantage that all heat-treating and distortion possibilities are eliminated.

One of the most important factors in grinding small holes is correct spindle speed, correct work speed and correct selection of wheels. A high-speed precision ball bearing spindle of approximately 35,000 to 60,000 r.p.m. should be used for grinding $\frac{1}{4}$-in. diameter or smaller holes, and it is important that the spindle has no end play or vibration. The revolutions of the work itself should also be as high as possible. Approximately 600 r.p.m. of the work speed for a $\frac{1}{4}$-in. diameter hole is appropriate, but for smaller holes a higher work speed would be of greater advantage.

Fig. 1 shows a 1-in. thick die block through which a hole of $\frac{1}{4}$-in. diameter was ground. The grinding was done into the solid and hardened tool-steel block by using a No. 3860-M Norton mounted wheel W-144. This wheel has a $\frac{1}{8}$-in. diameter; the periphery of the wheel has to overlap slightly the center line of the hole to be ground. This is important since a mounted wheel would not work otherwise. In fact, if the center of the wheel corresponded with the center line of the hole to be ground, the mounted wheel would only crush to pieces without any grinding effect. The wheel speed used for grinding the $\frac{1}{4}$-inch diameter hole, as shown in Fig. 1, was 60,000 r.p.m. and the revolution of the work itself approximately 600 r.p.m. The work was rotated opposite to the rotation of the grinding spindle.

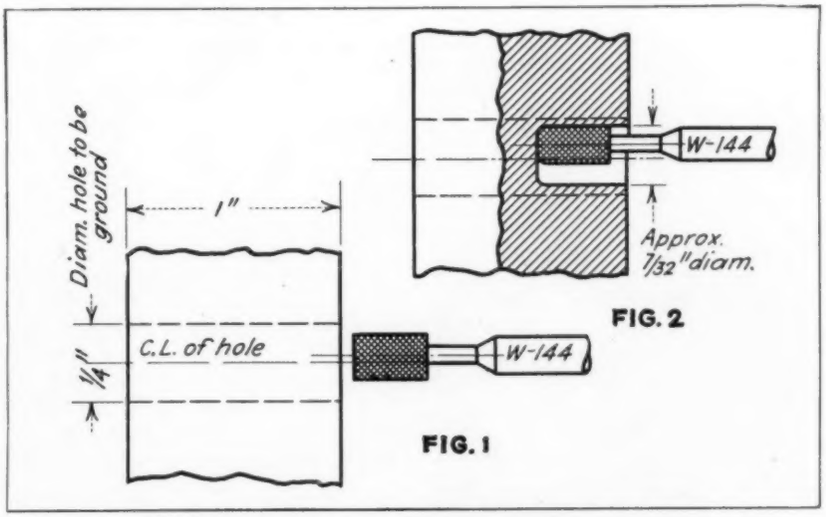


Fig. 1—Success of the grinding operation depends on correct wheel selection and the right cutting speeds. Fig. 2—A smaller diameter should be ground from the solid so the final sizing may be done on a through hole

Frequent Dressing Needed

When bringing the mounted wheel into contact with the work, it will be found that the end of the wheel will become slightly rounded during the grinding process, as shown in Fig. 2. This rounded shape should be maintained by frequent dessing as required. The feeding of the wheel against the work should be done with an intermittent pressure. This pressure amounts to a slight blow which is ordinarily described by grinder men as "bumping."

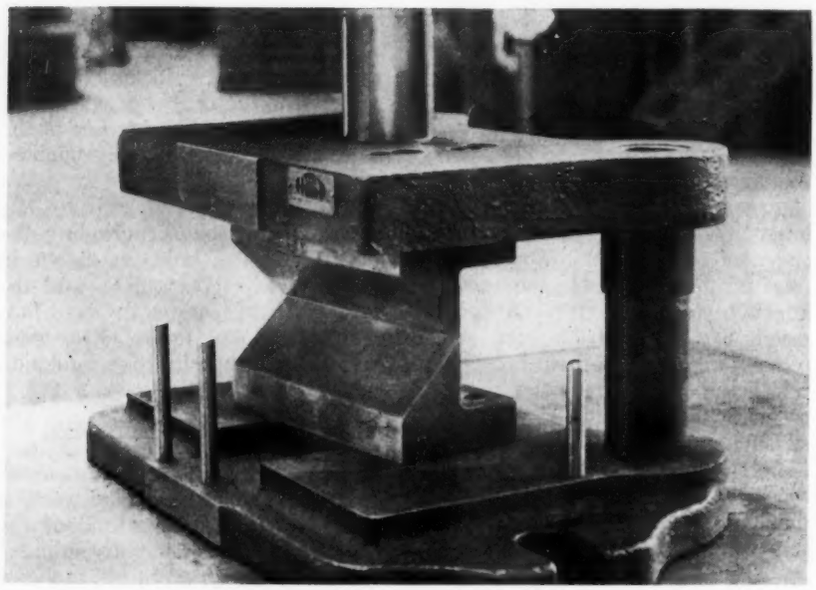
Fig. 2 shows the hole ground about half way through the hardened die block. It should be noted that the $\frac{1}{4}$-in. diameter hole is being roughed out to approximately $\frac{7}{32}$-in. diameter since the final grinding to the correct size has to be done after the hole is roughed out through the total thickness of the die block.

It requires approximately five to six hours to grind a $\frac{1}{4}$-in. diameter hole through a solid and hardened die block of 1 in. thickness, and approximately eight to ten mounted wheels are used for grinding.

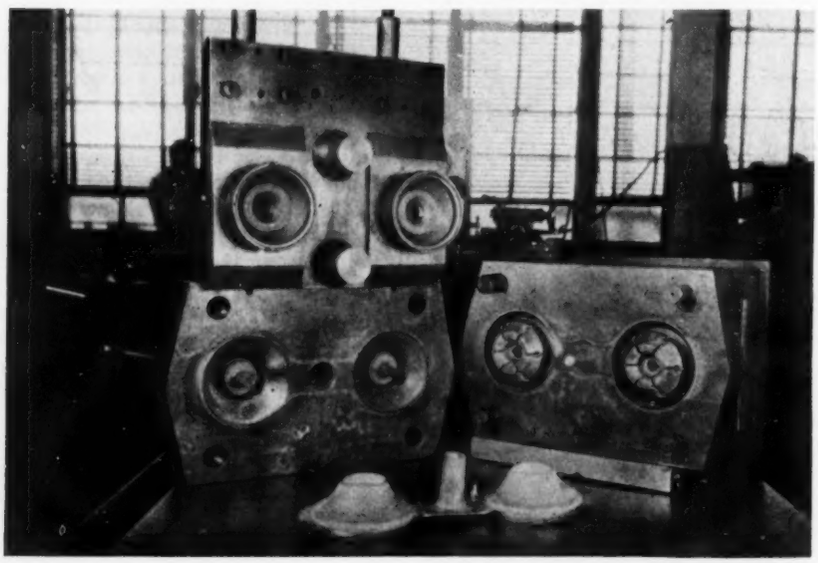
Accessory Tools for Die-Casting Production

In a well-organized jobbing die-casting plant the use of ingenious press tools and tapping fixtures speeds trimming and machining operations

HERBERT CHASE



Heavy sprues are sheared in a punch press, using a chopping die. This die has proved five to ten times as fast as a bandsaw



Two steering wheel hubs are cast at once in these dies. The slide (upper part at left) places the steel insert rings over the central cores in the rear half of the die

FOR UP-TO-THE-MINUTE die-casting production on a medium-size scale, there is much to be said regarding the arrangement and equipment of the new Continental Die Casting Corporation's plant at Detroit. Here is to be found one of the most modern layouts, not only for producing the castings, but also for constructing the dies, and for cleaning, inspecting and plating the castings when required.

Architectural features of this plant are being copied by other new plants in the Detroit area. Walls are practically all glass, the windows extending from bench height to ceiling. The insulated roof has large skylights fitted with glass that excludes heat, and artificial lighting provides a minimum of 25 ft. candles at the working level. Roof trusses of 70-ft. span minimize the number of columns and leave the floor clear for most convenient arrangement of equipment.

The front of the building is occupied by offices and a drafting room, and the rear by the casting room. The much larger area between is given over to machining and cleaning castings, for polishing and plating them, and for inspection. Space is provided for storage of dies and tools, and for a toolroom with full facilities for die construction. The plant covers about one acre.

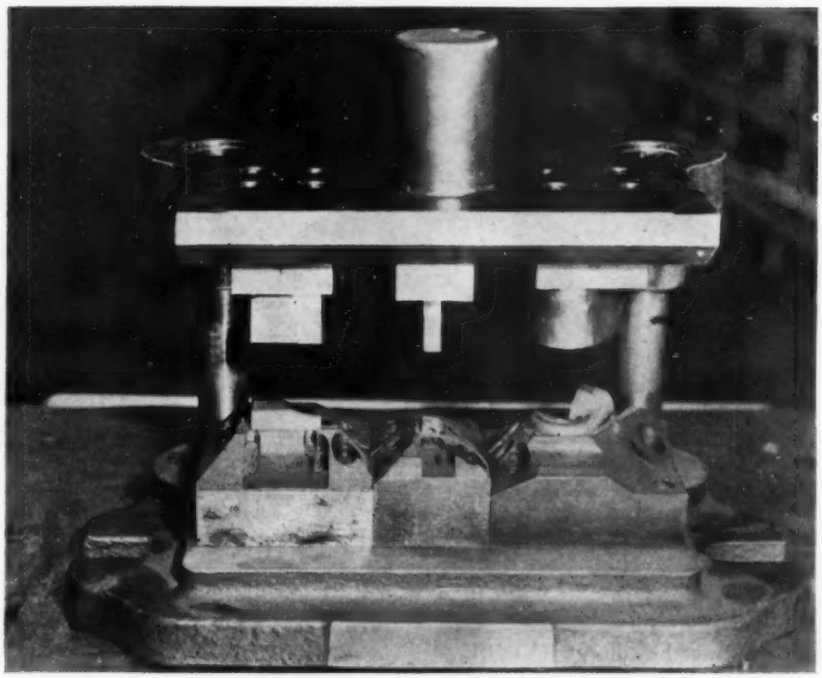
Casting is confined to zinc alloys, because the demand for these is three times that for all other mate-

rials combined. Alloying and melting are done at one end of the casting room, and the molten metal transported by trolley ladle to the casting machines. Each of these has its own gas-fired melting pot with control equipment to maintain the metal at 770-780 F. By supplying molten metal instead of ingots to the pots, temperatures remain more nearly constant, favoring uniform castings.

All die-casting machines in use are the Schultz type. They have a single locking toggle and air-operated plungers for metal injection at 1,600 lb. per sq. in. These machines turn out excellent castings with as fast a cycle as is feasible for the particular castings produced. The high pressure and uniform metal temperature (together with good die design and finish) are responsible for dense, smooth-surfaced castings. Production rates vary with different castings, as well as with the time required to place inserts, but range from 100 to 450 shots per hour. Since dies often have four or more cavities, the total production per hour is quite high. At one time castings were produced on a piece-work basis, but substitution of a straight hourly rate has resulted in a considerable production increase and more satisfaction to operators and management.

The casting room is unusually light, has a 20-ft. ceiling, and excellent ventilation. Metal pots are insulated to maintain comfortable working conditions. Operators wear asbestos gloves for handling hot castings, and supplement them with a heat-resistant holder resembling a spring-hinged spectacle case. Back of the operator and parallel to the machine is a metal-covered bench on which he lays hot castings. They are pushed along to the outer end to cool, and inspectors break off the sprues and gates. Following inspection, castings are loaded into tote boxes and trucked to an adjacent department where the fins are sheared, chiefly in punch presses.

Two unusual dies among the many employed for casting may be mentioned. One is for casting two steering-wheel hubs at once. Each casting has a steel ring insert of U-shaped section, and the inner surface must be kept free of zinc because the purchaser welds steel spokes to this surface. Therefore, the insert must be pressed firmly over the core that holds and centers it in the dies.



Three parts for a padlock are delivered in one gate to this three-section trim die, which chops off the castings and trims off the fins

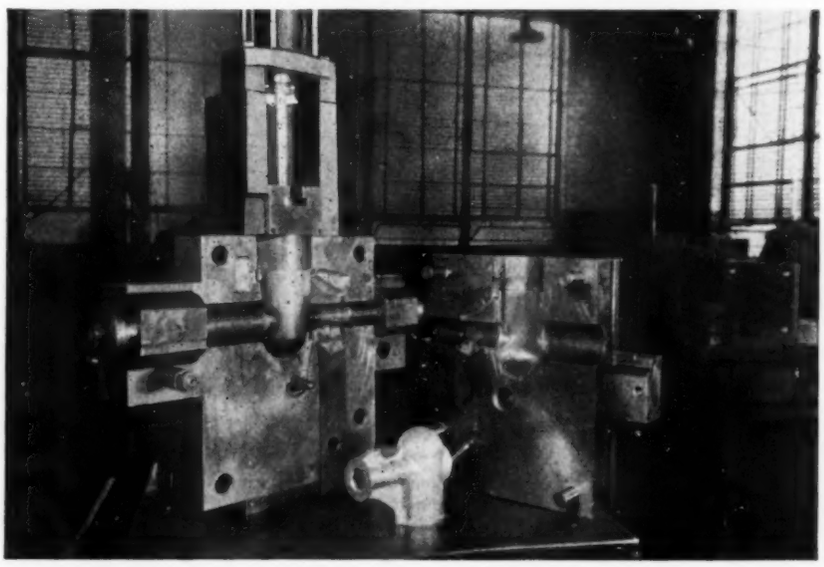
Inserts Loaded by Slide

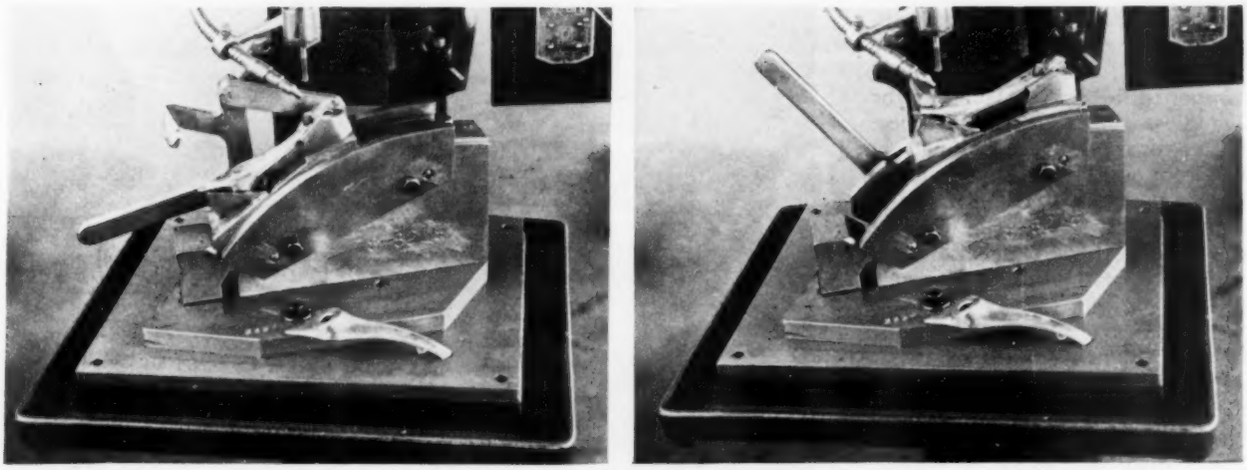
To facilitate placing the inserts in the hot die, they are loaded onto a slide arranged to drop between the die halves. The latter are partly closed by the toggle mechanism to force the inserts over the cores, and then the die halves are partly opened to remove the slide. Then the die is closed and the shot is made. While the castings cool, the slide is again loaded with inserts. Finally the die is opened, the castings ejected and the cycle repeated. With 100 shots per hour, 200 castings are turned out.

The second unusual die is a single-cavity type for producing the drive housing for a washing-machine wringer. This part requires three cores, all with axes in the plane of the die parting. Instead of being shifted by hand the largest core is withdrawn by a plunger fed from the same pump as the toggle mechanism. The large core is raised while the machine is opening the dies, resulting in faster operation. The two smaller cores do not move so great a distance to clear the casting, and are operated by pins.

Two air compressors supply air for metal-plunger operation and an-

Three cores are required for a wringer-drive housing, and the large main core is operated by a hydraulic cylinder to speed up production





Two holes at different angles and elevations are tapped in this fixture. *Left*—With the fixture handle down, one hole can be tapped. *Right*—Raising the fixture handle causes the part-holding portion to move through an arc on the sector blocks to position the second hole

other compresses natural gas to 12 lb. per sq. in for firing the metal pots and metal furnaces. Each die-casting machine is self-contained, except for air and gas supply. A monorail and hoist handle dies into and out of the machines.

There is also a well-equipped department for removing fins from castings and for doing machining operations required by customers. A large part of the trimming is done with shearing or shaving dies in a group of fifteen power-driven punch presses. Tools are arranged to insure rapid operation and to avoid hand cleaning and filing. Punch presses are also used to do some broaching operations, as well as for certain striking and swaging operations on surfaces requiring closer tolerances than can be held in the castings as produced.

From the cleaning department, castings are delivered to individual inspection benches. Any minor hand cleaning is done, and satisfactory work is passed to the shipping room or to the department that prepares surfaces and applies finishes when plating or enameling is to be done. If any grinding is required, particularly at parting lines, it is done here, followed by buffing. Both operations are usually performed by hand on conventional equipment. Some partly automatic equipment is employed for castings that lend themselves to such treatment.

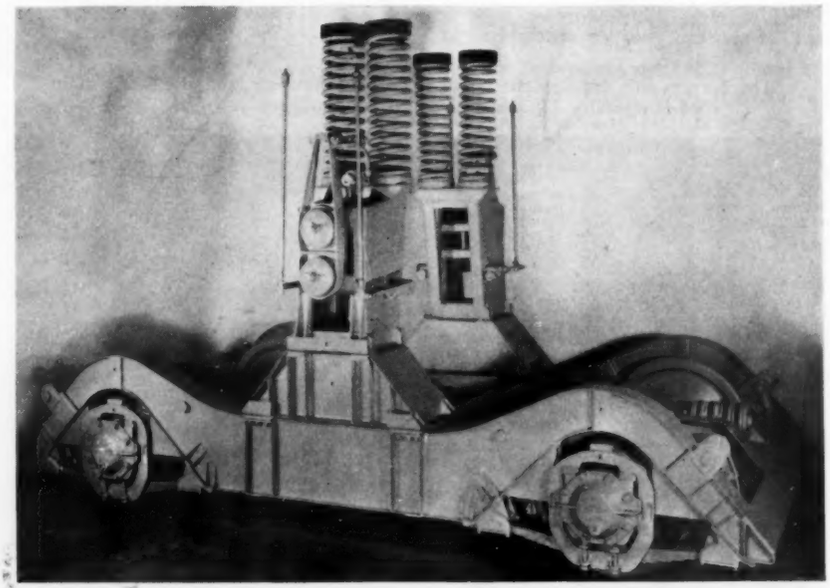
After buffing and inspection, castings are carried on wooden trays to the plating department. Since Continental is one of the few jobbing die-casting plants to have its own plating department, the cleaning and plating operations will be described in a forthcoming number.

"Pendulum" Train Has Fabricated Trucks

RECENTLY PLACED in test service on the Atchison Topeka and Santa Fe district railway line near Los Angeles, Calif., is the new "pendulum" type passenger car which has a novel method of suspension. The point of car body support is above rather than below its center of gravity. Soft vertical coil springs permit all the necessary truck motion. Instead of leaning outward in rounding a curve, the car actually banks creating greater smoothness and stability.

Wheelbase is 9 ft. for the end trucks and 12 ft. for the articulated truck which is separable so it can be uncoupled in making the train.

The pendulum train is considerably lighter in weight than the newest streamliners. The body of the experimental unit was constructed of wood, but future cars will be of high tensile steel. The lessened amount of deadweight is expected to be reflected in operating savings.



The new pendulum truck unit is made entirely of high tensile steel plate and shapes by electric welding. Side members are built up in box sections fabricated with the use of Flexweld shielded arc electrodes. All welds are stress relieved

ROUND TABLE

Preventive Maintenance

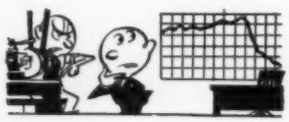
"Ed, did you ever wonder where our delivery promises would have gone if either of those two turret lathes on the impeller shaft job had folded up during the late lamented period of rush orders?"

"We'd have been right behind the eight ball, Al—or rather, you would have been—why try to drag me in? I'm only a stockholder."

"Don't forget that you'd have been crying on my shoulder if that dividend check had been missing last fall, Ed. You've a lot of responsibility for the condition of this plant—don't forget that we can't do much if you won't let us spend enough to keep the equipment in shape."

"What's all this leading to, Al? You haven't enough business now to justify any maintenance work—better pull in your horns."

"Listen, Ed. We've been patching those two machines for the past year. They should have been overhauled a long time ago—I want to pull them apart now, while the shop is slack, and have them ready for the next boom. It will give the men something to do and we won't have



to do it later when everyone is howling for service."

"And get the plant on the skids ready for the sheriff! Nothing doing."

"Ed, you remind me of the farmer who didn't patch his barn roof during the dry season, because it didn't need it then. If I remember the story correctly, he found his horses wading in a lake soon after."

Should maintenance work be delayed during slack periods because of a reduced budget?

DISCUSSION

Gift Horse

Herbert M. Darling, in discussing the advisability of permitting any gifts to foreman and other supervisors points out that: "The workman who starts a subscription list to buy the boss a present usually is trying to curry favors. Most men who are asked to contribute will do so willingly, some because they really like the foreman and the rest because they, too, hope to win his favor." Mr. Darling believes that there should be definite rules against presents to any supervisors, except on their resignation or retirement.

Train in Vain

"All too frequently a good workman has not only to leave the department, but the company as well, in order to gain recognition," is one of the highlights of John Mark May's discussion of the question of holding a man back from promotion. He goes on to ask "Who would want to be held responsible for keeping a capable man from a promotion that he deserved?"

P. Bentley, tool room foreman in the Ogden Shops of the Canadian Pacific Railway, thinks that Ed should feel proud of having helped get Bill Green started, and should realize that a successful business is not maintained by the efficiency of one department alone. In much the same vein, Robert Knotek, die department foreman in Fisher Body's Cleveland plant, points out that "One of the most aggravating things that can happen to a person is to have some one else come along and upset his plans . . . but, being a successful executive, Ed should be broad-minded enough to realize that the success of his organization depends upon the smooth operation of the whole plant."

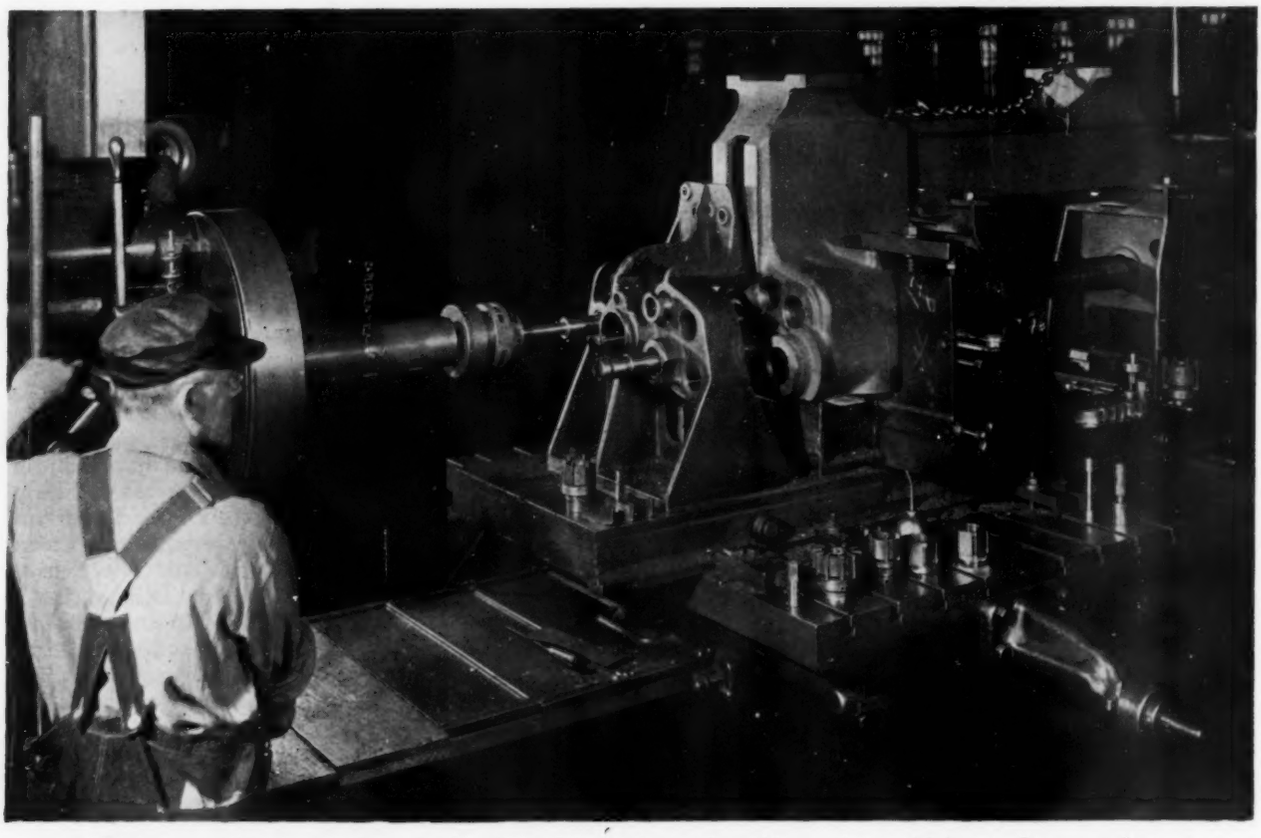
"It would, of course, be impractical to keep shifting workmen around without any purpose in mind, but a foreman having broad experience is far more valuable to the company than one who has risen from the ranks because of expert workmanship in only one department," writes Alfred O. Blumenthal. He believes that a foreman who has worked in more than one department will be able to plan and supervise more satisfactorily. One of the dangers of hindering the transfer of a workman to a better job is brought out by Harry A. Pappas, who writes: "There are many men who prefer working on the same job day in and day out, but the majority are very sensitive about being made to feel that they are chained to their jobs.

Wages Warranted

Rudolph L. Behounek, general machine supervisor, Western Electric Company, writes from Cicero, Ill., to point out that "There seems to be no legitimate excuse for paying shop men in the form of an annual wage. The amount of pay remains intrinsically the same—the only difference being that it is to a certain extent guaranteed. However, if an employer is unable to pay his men it will make little difference whether the wages are guaranteed or not. The most important point, however, is that a guaranteed annual wage will not stabilize employment as some people contend."

Beginner's Luck

"Many good men, after having been unemployed for a while, lose some of the skill that was theirs during a previous period," says Arthur Silvester. He points out that this often causes them to slip up on the first job they attempt when they start to work again. Mr. Silvester queries "What would Ed have done if one of the older hands had spoiled the form tool in a similar manner?"



Boring operations are performed with the bed in an inverted position, using multiple-step flat cutter bars driven by floating couplings. When the bed is clamped down, two indicators show that it has not been sprung

Beds for Turret Lathes

Accuracy of a turret lathe depends first on how carefully the bed is machined. Production schedules, jigs, and fixtures, guides, tooling set-ups and handling problems must all be planned skillfully

GEORGE L. KLUTER
Production Engineer, The Warner & Swasey Company

A COMPLICATED CASTING like a turret lathe bed with massive ways and a bulky head at one end is difficult to handle, even in the smaller sizes. The largest size in the ram-type lathe made by the Warner & Swasey Company is a casting 7 ft. long that weighs 1,300 lb. As many as twenty flat surfaces and ten large bores must be machined and 110 holes are drilled or tapped.

All castings are rough ground on surfaces that are not to be machined, given an undercoat of paint, smoothed with quick-drying filler and painted. It not only is better to paint a casting before it is soaked with oil in the machine shop, but we find that everyone who handles a painted casting treats it with more respect. Casting and machining of ram-type lathe beds is done on a semi-production basis, generally in groups of 20 units each. After castings received from the foundry have become adjusted to room temperature, the first step is to lay out the cuts, making sure that there is enough stock all around. For this purpose, the spindle holes and the ways are used as reference points.

We find it economical to have the planer operator who makes the first rough cuts lay out the work, doing both in the same operation. This operator rough planes the ways and undercuts, leaving about $\frac{1}{16}$-in. for finishing. The dimensions that must be very accurate are rough cut first. They never are roughed and finished in one operation.

In fact, finish cuts usually are made on another machine. After the first rough cuts, the bed is turned over and set with the ways on two chairs for planing, parallel to the ways, the bottoms and both

Accurate results in machining operations on a turret lathe require particular care in machining the bed and other component parts that finally are assembled to form the lathe. Final boring for spindle bearings is done on the assembly floor with a culminating telescope alignment fixture

sides of the legs. The bottom of one leg then is given a ¼-in. step cut to compensate for slope in the chip pan.

The bed next is moved to another planer, where it is set upright for the finish planing of the ways, undercuts, gib seat and pads on the front of the head. The top of the head is rough and finish planed, then it is set up on a horizontal boring mill where the head end, drive shaft boss, end of ways, automatic chuck and hand longitudinal feed pads and pushbutton plate pad are finish milled.

From the horizontal mill, the bed goes to a drill press where 24 holes are drilled, counterbored and tapped for bolting on the head cover. After the first drilling operations, the bed is moved again, this time to a horizontal boring mill for rough boring the spindle hole and five shaft holes. High-speed steel, tungsten carbide and Stellite tools are used. In almost every set-up, jigs and fixtures of welded construction are used to insure interchangeability. Years later, if a service part is needed, everyone can be sure that it will fit.

On the second horizontal mill, the bed is inverted, supported on a line boring fixture located from the ways, and the holes are all roughed out with multiple-step flat cutter bars driven by floating couplings. These tools bore all steps in each hole at once. The fixture does all the aligning. In the spindle holes 0.050-0.055 in. is allowed for the finished bore and ream operation, while 0.030-0.035 in. is allowed in the shaft holes. This operation, which incorporates in one setup the use of multiple-step flat cutters, a floating coupling arrangement and inverted boring, is one of the principal developments in the machining of turret lathe beds. It has made one of the most difficult steps in the process accurate, economical and efficient, especially in reducing setting up and cutting time.

Multiple-step tools are used in shaft holes up to a 5-in. bore and in spindle holes up to a 10-in bore. As many as five steps are bored with one cutter. When the bed is clamped down, two indicators are used to show that it has not sprung. One indicator is used for up-and-down motion, the other for horizontal motion.

Next step in the process is the important one of assembling hardened strips of steel to the ways. Strips are secured with specially heat-treated screws set 4-in. apart on the front and 3-in. apart on the back strip. Tap drilling must be carefully done, since each tapped hole in the bed must be exactly concentric with the hole in the way strip. If any are not, the screw will not exactly fill the hole, leaving a cavity for the collection of chips and dirt and the result will be wear on the other member sliding over the ways. The screws are tightened until they are broken off.

The bed then is carefully set up on a way grinder and the tops of the ways are finely finished so that it is almost impossible to see any trace of the screws with the naked eye. The bed first is supported at three points and accurately leveled with a 5-sec. level. Clamp-resisting jacks are used, the operator taking every precaution to make sure that there is no twisting or distortion. The grinding operation proceeds slowly and carefully. An extra-capacity water cooling system keeps the work well flushed at all times to prevent trouble with heating the bed. In this same setup, the outside and inside edges of the front way, as well as the apron gib pad, also are ground.

The finish boring and facing of the front spindle hole, the finish boring, reaming and tapping of the shaft holes and the boring of the rear spindle hole is done with the same type fixture as used in the rough cutting operation. The same precautions are taken against springing the bed and the same type indicators are used. However, in finish boring, single-point cutters are used and holes are sized with reamers.

Positive Lead for Tap

This fixture has hardened and ground guide bushings and there are hardened and ground strip pilots on the boring bars. For tapping shaft holes, a mechanical leader is built into the fixture to eliminate the possibility of any thread stripping. This arrangement, another development which simplifies a difficult machining operation, saves time, makes for extreme accuracy and removes the human element in line tapping. All the operator has to do is insert cutters, start his machine and watch it work.

In this finish boring setup, all shaft holes are completely finish reamed and tapped, but 0.020-in. is left in the front and rear anti-friction bearing seats of the spindle hole. This last 0.020-in. on the

bearing seats, the most important machined surfaces on a turret lathe, is taken off on the assembly floor. Facing and counterboring the spindle holes and inside spindle faces is the next operation in the machining process. Bushings are inserted in the front and rear semi-finished spindle holes and a bar with a floating coupling is put through them. For facing the inside of the front and the rear spindle boss, facing heads with flat cutter heads keyed in the bar are used.

With the bed in an upright position on a boring mill at this point, the front and rear bearing closer diameters are finish bored. A simple-point cutter is used. Combining these two operations in one setup, in addition to saving time, balances the running time of this setup with that of others. It is of first importance, of course, in efficient utilization of large equipment that the running time of operations be well balanced. No piece of large equipment should be idle for very long waiting for work to be completed on another machine.

Before turning the diameter of the drive shaft boss, seven holes are drilled and counterbored in the front face of the spindle for the closer plate. The jig used for this drilling operation locates in the spindle bore. For turning the diameter of the drive shaft boss, a hardened bushing is put into the finish reamed drive shaft hole to make sure it is true. A large, specially designed turning head is bolted on the flywheel of the boring mill spindle. The outside diameter is cut with a single point tool. On the same head, in the same operation, is attached another cutter for facing the surface to which the belt guard is bolted.

The bed next is set up on the knee of a radial drill press for drilling, counterboring and tapping of fourteen small holes in the head end. Seven of these holes are around the rear end of the spindle boss and the other seven around the belt drive-shaft boss. The jig used for this operation is located from the spindle hole and the drive shaft hole.

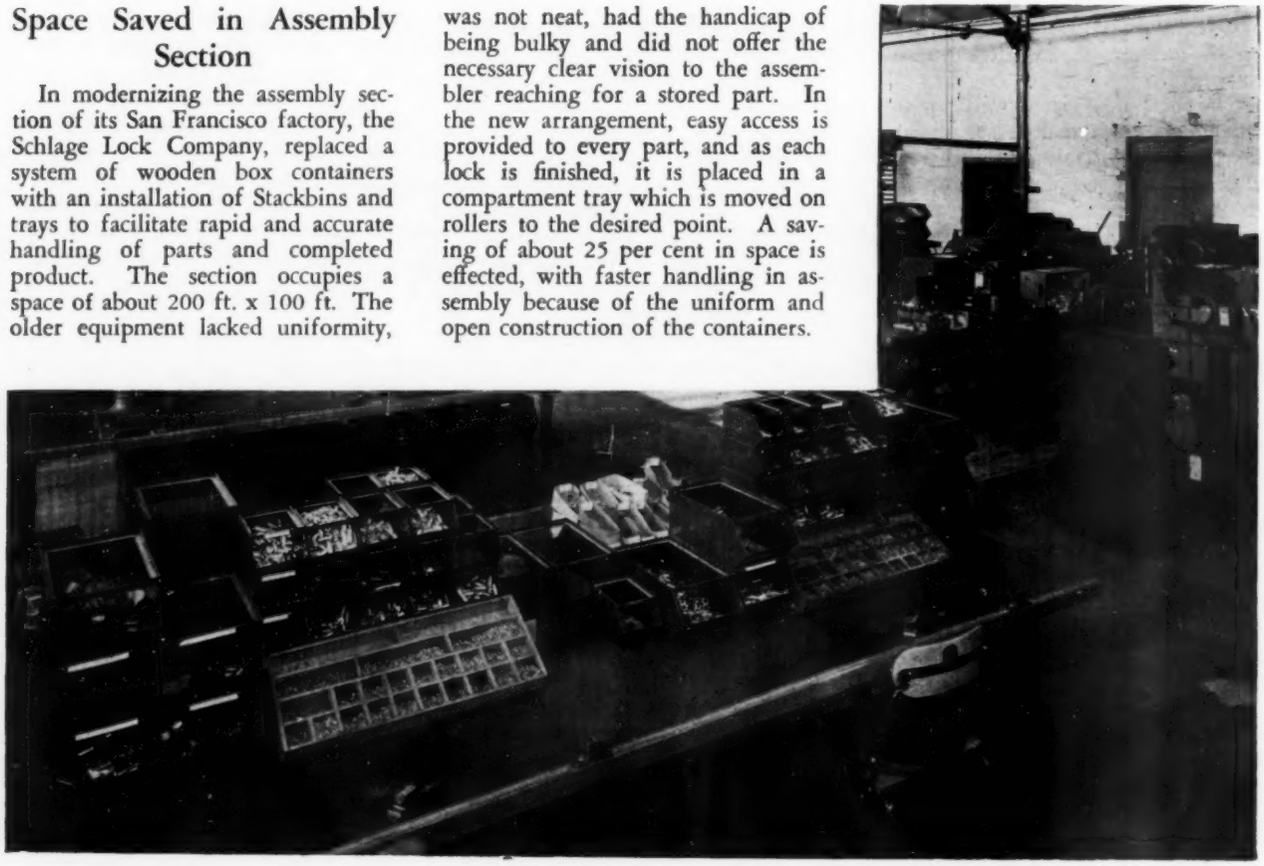
Simple drilling, milling and planing operations complete the machining of the bed. The woodruff keyway in the drive shaft boss is milled and several small holes are drilled, bored, reamed, counterbored, and tapped. These holes are for mounting various brackets used on the machine. When a customer orders a special turret lathe that is not universal, the bed is drilled, counterbored, reamed and tapped at this point for the hand longitudinal feed braket.

Finally, the bottoms of the legs are taper planed to compensate for the slope in the chip pan needed for gathering the coolant into the pump basin. One of the legs already has been given a $\frac{1}{4}$-in. step cut, as previously explained. For final taper planing of the legs, the bed is set in an inverted position on two chairs that are fixed to the proper taper. Stellite tools are used in this planing operation to cut through any scale that may have formed in the inverted pouring of the casting.

On the assembly floor, after the pan has been mounted on the legs and other attachments have been added, and after the bed has been precisely leveled, the finish boring of the spindle hole is very carefully done with a columnating telescope alignment fixture. Only extremely accurate work done with a precision fixture of this kind will insure machined bearing seats that are absolutely parallel to the ways.

Space Saved in Assembly Section

In modernizing the assembly section of its San Francisco factory, the Schlage Lock Company, replaced a system of wooden box containers with an installation of Stackbins and trays to facilitate rapid and accurate handling of parts and completed product. The section occupies a space of about 200 ft. x 100 ft. The older equipment lacked uniformity, was not neat, had the handicap of being bulky and did not offer the necessary clear vision to the assembler reaching for a stored part. In the new arrangement, easy access is provided to every part, and as each lock is finished, it is placed in a compartment tray which is moved on rollers to the desired point. A saving of about 25 per cent in space is effected, with faster handling in assembly because of the uniform and open construction of the containers.



AMERICAN MACHINIST *Reference Book Sheet*

Cutting Speeds for High-Speed Saws

These data can be used for either cutting-off or slotting operations, and are published through the courtesy of the Morse Twist Drill & Machine Company

Material	Peripheral Speed Ft. per Min.	Lubricant
SAE 3245	40-45	Sulphur base oil
SAE 3130	50-60	Sulphur base oil
Annealed tool steel Untreated alloy steel	60-70	Sulphur base oil
Cast-iron	70-90	None
Soft mach. steel Cold rolled steel Malleable castings	90-160	Soluble oil
Bronze	600	None
Brass	800	Lard oil $\frac{2}{3}$ kerosene $\frac{1}{3}$
Aluminum	1000	Kerosene

Feeds, In. per Min. for Different Materials

Saw Thickness	Depth of Cut	Tool Steel Cr Ni Steel	Cold Rolled Steel	Cast Iron	Brass	Aluminum
$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{2}$	$\frac{3}{4}$ - 1	$\frac{3}{4}$ - 1	1	$1\frac{1}{2}$
$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{4}$ - 1	$1\frac{5}{8}$ - 2	$1\frac{5}{8}$ - 2	2	$2\frac{1}{2}$
$\frac{1}{8}$	$\frac{1}{4}$	1 - $1\frac{1}{2}$	2 - 3	3 - 4	5	8
$\frac{3}{16}$	$\frac{1}{4}$	" - $1\frac{1}{2}$	2 - 3	3 - 4	5	8
$\frac{1}{16}$	$\frac{1}{4}$	$1\frac{1}{2}$ - 2	$2\frac{1}{2}$ - $3\frac{1}{2}$	3 - 4	10-20	12-24

Ft. per Minute	40	50	60	70	80	90	100	125	150	175	200	300	400	500	750	1000
Diameter	Revolutions per Minute															
$\frac{1}{2}$	306	382	459	535	611	688	764	955	1146	1337	1528	2292	3056	3820	5730	7640
$\frac{5}{8}$	245	306	367	428	489	550	612	765	917	1071	1224	1836	2448	3060	5190	6120
$\frac{3}{4}$	203	254	306	357	408	458	508	635	764	889	1016	1524	2032	2540	3810	5080
$\frac{7}{8}$	175	219	262	306	349	393	438	548	655	767	875	1314	1752	2190	3285	4380
1	153	191	229	267	306	344	382	477	573	668	764	1146	1528	1910	2865	3820
$1\frac{1}{2}$	102	127	153	178	204	229	255	318	382	445	509	764	1020	1275	1912	2550
2	76	95	115	134	153	172	191	238	286	334	382	573	764	995	1432	1910
$2\frac{1}{2}$	61	76	91	107	122	138	153	191	229	267	305	458	611	764	1147	1530
3	50	63	76	89	102	115	127	159	191	222	254	382	509	636	952	1270
$3\frac{1}{2}$	43	54	65	76	87	98	109	136	164	191	218	327	436	545	818	1090
4	38	47	57	66	76	85	95	119	143	167	191	286	382	477	716	955
$4\frac{1}{2}$	34	42	50	59	67	76	84	106	127	145	169	254	339	424	636	849
5	30	38	45	53	61	68	76	95	115	133	152	229	305	382	573	764
$5\frac{1}{2}$	27	34	41	48	55	62	69	86	104	121	138	288	277	347	512	694
6	25	31	38	44	50	57	63	79	95	111	127	191	254	318	477	636
$6\frac{1}{2}$	23	29	35	41	47	52	58	73	88	102	117	176	235	293	440	587
7	21	27	32	38	43	49	54	68	81	95	109	163	218	272	409	545
$7\frac{1}{2}$	20	25	30	35	40	45	50	63	76	89	101	152	203	254	382	509
8	19	23	28	33	38	43	47	59	71	83	95	143	191	238	358	477
9	17	21	25	29	34	38	42	53	63	74	84	127	169	212	318	424
10	15	19	22	26	30	34	38	47	57	66	76	114	152	191	286	382
11	13	17	20	24	27	31	34	43	52	60	69	104	138	173	260	347
12	12	15	19	22	25	28	31	39	47	55	63	95	127	159	239	318

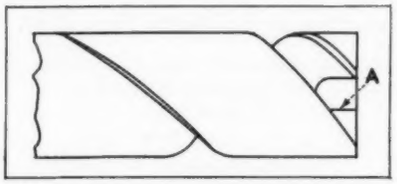
IDEAS FROM PRACTICAL MEN

Drill Jig for an Odd-Shaped Part

CHARLES WESLOW

The jig illustrated is for holding the work indicated by heavy dotted lines while two holes are being drilled through the bushings *A*. The work is located by the segment contacting the triangular block *B* against which it is held by an Allen setscrew in the post *C* at the left, the straight part being held down on the pins *D* by another Allen setscrew at *F*. Pipe the homemade thumbscrew *H* for holding the work sidewise. Ain't it cheap?

A jobbing shop would want at least $20 for making a jig to do this drilling, but I designed and made the whole thing in five hours. Every time I start to make a jig for the shop in which I am employed, I make a bee line for the junk pile to see what I can find that can be utilized. Incidentally, the junk pile is nicely laid out on a large shelf so that pieces can be selected for the job in hand. Very few shops have any respect for their junk piles. The junk is generally thrown into boxes in which nobody cares to look.



This drill acts as a counterbore and removes the metal around the broken portion of the pilot drill, and permits it to be removed with pliers

Method of Removing Broken Drills

W. N. BROWN

In drilling comparatively deep $1\frac{1}{8}$-in. holes in rather hard cast iron, we find it advantageous to drill to depth with a $\frac{1}{8}$-in. pilot drill and follow with the $1\frac{1}{8}$-in. drill. Occasionally a pilot drill is broken some distance below the surface of the work. We then drill down to the broken part of the pilot drill with the $1\frac{1}{8}$-in. drill. Next we grind a $1\frac{1}{8}$-in. drill flat at the cutting end and grind a slot at *A* the size of the broken drill, as shown.

We follow the first drill with this specially ground drill, which cuts away the metal around the broken part of the pilot drill, acting as a counterbore. Thus, the broken part of the pilot drill is exposed and is easy to get hold of with pliers.

Plug Gages and Reamers Made From Old Taps

PHILIP J. RAAB

A go and not go plug gage can be made by grinding the threads off of a worn-out tap. The features are that the lands permit the holes to be checked for roundness and the fluted body cleans the dirt out of the holes.

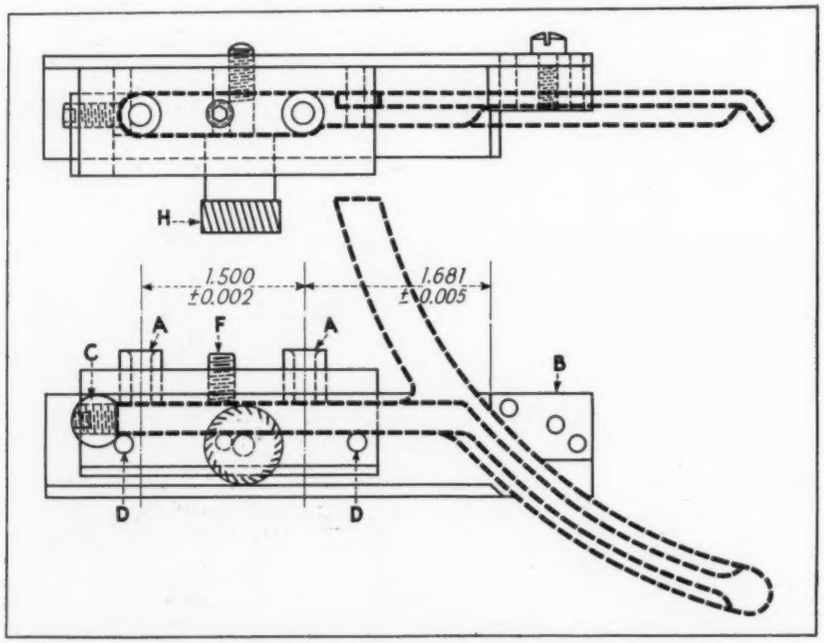
Instead of throwing the gage away when it is of no further use as a gage, it can be reground to make a small hand reamer. Some of the advantages are that the tool has already been fluted, hardened and the square for the wrench has been milled.

Fixture-Elevating Device

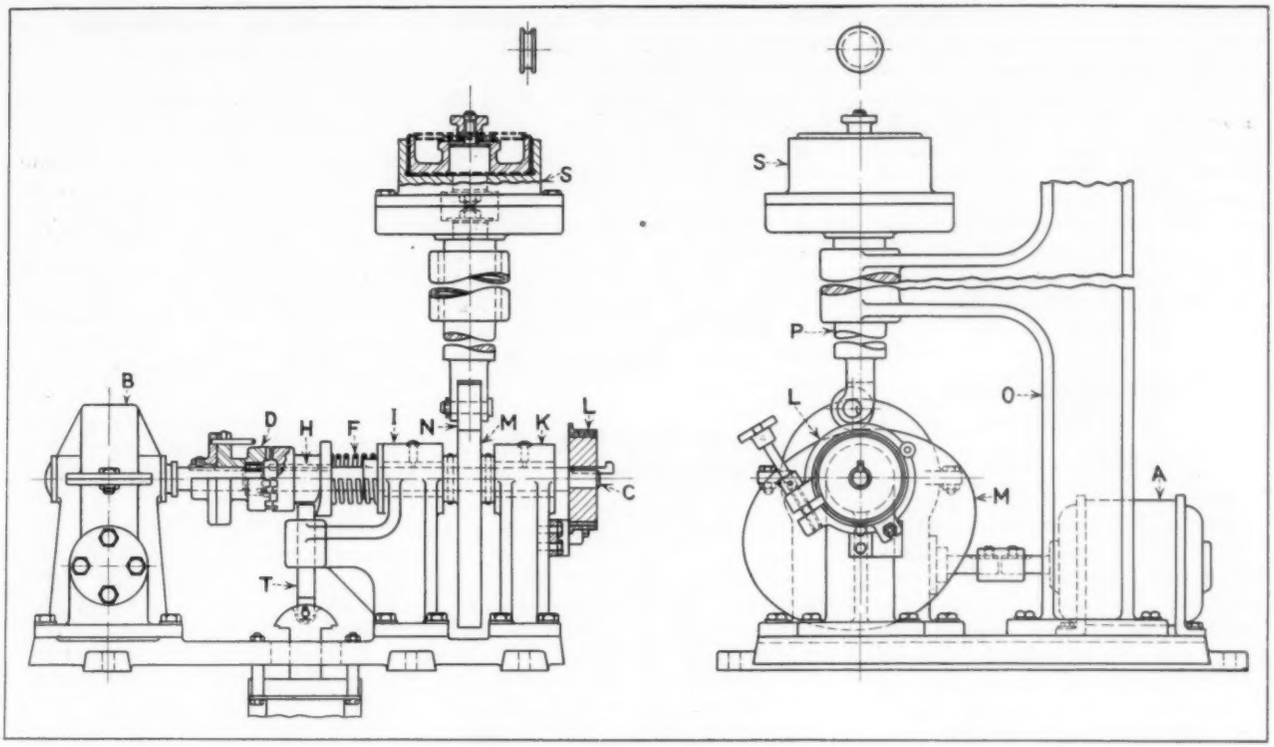
WILLIAM B. GREENER

The device illustrated was designed primarily with the idea of eliminating the fatigue element. The work to be performed is forming an inside curl on the upper edge of a steel part (shown in heavy dotted lines) similar to a short piece of large-diameter seamless steel tubing. The work was required to be raised so that it could be operated on by three curling rolls driven by the vertical spindle of a machine, not shown, and held while the rolls made three revolutions, then lowered for unloading and loading the fixture. Formerly the operator raised and lowered the fixture by hand by means of a crank-operated pinion and rack, and on hot summer days the work was very fatiguing.

Essentially, the device consists of the motor *A;* the speed reducer *B;* the shaft *C;* the clutch *D;* the spring *F;* the cam *H;* the pedestals *I* and *K;* the brake *L;* the elevating cam *M;* the cam roller *N;* the upright pedestal *O;* the vertical shaft *P;* the work holder *S;* the pin *T;* and a solenoid operated by a foot switch not shown.



This jig was made in five hours from pieces picked out of the junk pile which was nicely arranged on a large shelf



The fixture is raised by a motor-operated cam, bringing the work into contact with the curling rolls and holding it until the operation is completed

In operation, with the motor and the speed reducer running, applying pressure of the foot to the switch energizes the solenoid and causes it to withdraw pin *T* from cam *H* and to permit spring *F* to engage clutch *D* and set the mechanism in motion. The cam *M* then raises the work holder and brings the work into contact with the curling rolls and holds it for the time necessary to complete the operation. Then as cam *M* continues to revolve, the work is gradually lowered. When it is in its lowest position the foot is released from the switch, pin *T* is raised into engagement with cam *H*, and when the highest point of the cam is in contact with the pin the clutch is disengaged. Application of the hand brake *L* then brings the mechanism to a full stop. The holding fixture can then be unloaded and loaded. Releasing the hand brake and applying foot pressure to the switch will again start the mechanism.

Backrest With Dial Indicator

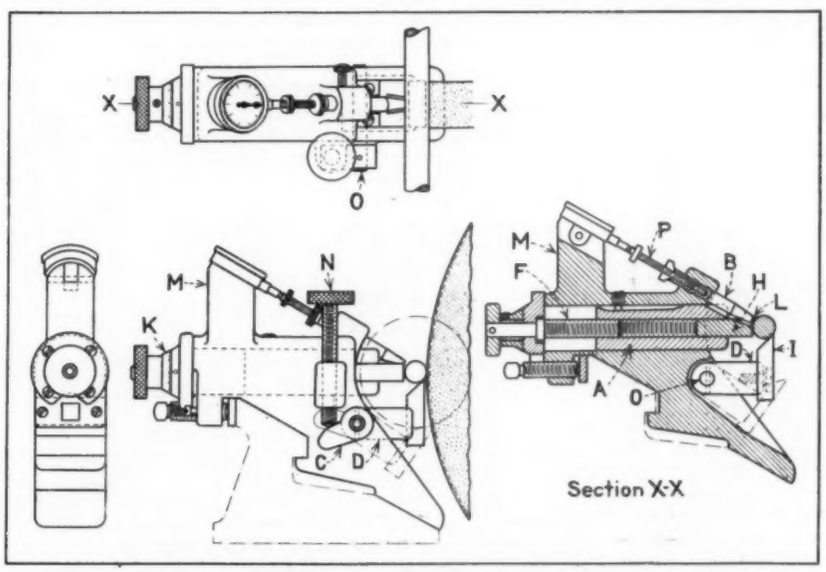
J. R. WHITTLES

A two-point backrest is shown for the cylindrical grinder having a dial indicator to register the progress of grinding and the runout of the work.

The body is bored for the cylindrical piece *A* and the extension *B* of the indicator spindle. It is also machined to receive the levers *C* and *D* and is drilled and tapped for the various screws. The cylindrical piece *A* is a sliding nut for the micrometer screw *F* and carries the horizontal shoe *H*. Lever *D* carries the lower shoe *I* which is hardened and ground and has an elongated screw hole for adjustment.

The knob of the micrometer screw is knurled and has a graduated flange at *K*. Extension *B* of the indicator spindle has a diamond at *L* to resist wear. The dial indicator is held by a pin in a slot in the lug *M* and rests against its finished surface. The knurled-head screw *N* operates the lower shoe *I* through levers *C* and *D*, both of which are held on the shaft *O* by pins.

In operation, screw *P* is turned to adjust the extension *B* of the indicator spindle to suit the finished diameter of the work and the dial of the indicator is set to zero. The



A diamond in the end of the indicator spindle extension bears on the work and resists wear. Progress of grinding is registered by the dial indicator

horizontal shoe *H* is adjusted to the work by the micrometer screw *F* and the graduated flange is set to zero. The lower shoe *I* is brought into contact with the work by screw *N* through levers *C* and *D* and is moved away from the work by gravity when screw *N* is backed out. The diamond in the extension of the indicator spindle is kept in contact with the work by gravity and the pressure of a light spring in the indicator.

Foolproof Attachment to a Drill Jig

PAUL C. BRUHL

Two $\frac{1}{8}$-in. holes were drilled at *A* and *B* in the work indicated by heavy dotted lines. The jig illustrated was made so that after one hole had been drilled, the work was removed from the locating stud *C*, rotated 180 deg. in the vertical plane and put back on the locating stud. Since the holes were offset from the center of the locating stud, some means had to be provided to indicate to the operator in which one of the holes in the jig plate the drill must be inserted when either one or the other of the wings of the work was uppermost.

The problem was solved by utilizing the offset of the wings to locate the foolproof gage *D*. The gage is U-shaped and is slidably attached to the jig plate *F* by the pin *H*. The gage has two holes in the top to let the drill pass through, the center distance between them being twice the amount the drilled holes are offset from the center of the locating stud.

In operation, when the work is placed on the locating stud and before it can be pushed back against the vertical member of the jig, the gage must be slid sidewise to permit the uppermost wing of the work to enter between its legs. By the sidewise movement, one of the holes in the jig plate is covered up, leaving the other one open. By looking through both holes in the gage the operator can see which one is open to the hole in the jig plate. He then lowers the drill into that hole and proceeds to drill the hole in the correct location in that particular wing.

Depth Gage Used as Inside Micrometer

H. MOORE
Leeds, England

It is often convenient to use a micrometer depth gage as an inside micrometer on lathe work, and the method illustrated has proved to be satisfactory for the purpose.

A bar centered at both ends is milled away for one-half its diameter, as at *A*, and a saw slot is cut at *B* to clear the spindle of the depth gage. The bar is held on centers and is long enough to permit the tailstock to be out of the way of the carriage.

To test the alignment of the bar, the gage is used in the horizontal position and one side of the hole is measured. Then the bar is turned half-way around and the opposite side of the hole is measured. If both measurements are the same, the bar is in alignment. With the bar in correct alignment, measurement of the hole is made with the gage in the vertical position. The measurement is, of course, one-half the diameter of the hole.

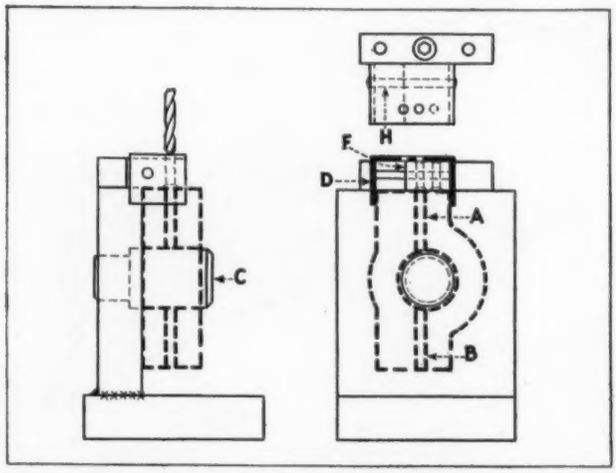
Grinding Non-Metallic Rollers

P. W. ZEIGLER

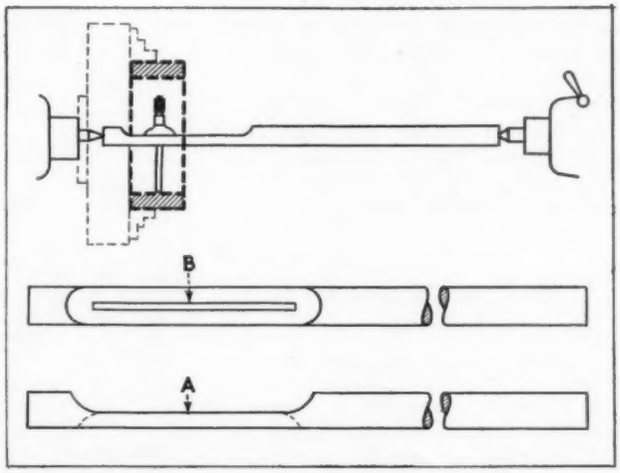
From time to time it is my job to grind rollers having a covering of rubber or composition over steel cores. In measuring these soft materials I found that small spring calipers were much more sensitive than a micrometer. By transferring the size to or from the work with inside and outside calipers and a mike it was possible to do accurate work. Taper was reduced to the minimum by setting up the grinder with a steel test piece of suitable length. Removal of stock on rubber rollers was as much as $\frac{1}{4}$ in., most of which was roughed off in one cut, leaving about 0.015 in. for finish in two passes of the wheel. The wheel was 80-K and was used without coolant.

Another type of roller ground was the same as that just mentioned, except that after grinding to a slightly smaller diameter it was helically wrapped and cemented with a latex-impregnated felt covering that had to be ground to size and straightness. The latex in the felt caused much gumming of the wheel when taking the roughing cut in the normal manner. After experimenting it was found that by passing the wheel rapidly across the roller, most of the gummy deposit was stripped from the wheel face and caused no further trouble in making the finishing cut in the normal way. The wheel was 46-grain Bakelite and was used without coolant.

It was found that placing the finished rollers in extra-heavy paper tubes and standing them on end in special racks prevented flat spots.



Attached to the gage is a pin that slides in the jig plate. The gage must be moved sidwise to permit the work to be properly located



A micrometer depth gage can be used as a substitute for an inside micrometer in measuring diameters of comparatively large holes

NEWS OF THE INDUSTRY

Split of U.A.W. Into Two Unions May Be Headed Off by Compromise

Steel Workers Organizing Committee gets setback when Armco's Butler plant workers reject it by vote of 1243 to 402

DETROIT—The possibility of a split of the United Automobile Workers into two unions is being talked about in union as well as in management circles. Such a split might grow out of the open warfare carried on for months by the Reuther group of so-called radicals or insurgents as opposed to the Homer Martin group which is in control of the present administration.

Neither the C.I.O. nor car manufacturers would welcome establishment of a strong union rivaling the U.A.W. The C.I.O. leaders would be compelled to make a ticklish choice and obviously the strength of the automotive labor movement would be somewhat impaired. On the industry's side, management thinks that its troubles with labor would be multiplied three or four times by the setting up of a second union. Instead of being the source of satisfaction because labor was not united, a split would just be a bigger headache for car companies.

Much of the strife and lack of discipline within the U.A.W. stems from the fact that President Martin is reported to be a poor administrator. In rallying workers to the union standard by means of a rousing speech, he is unsurpassed; some of his C.I.O. colleagues have termed him a "master rabble-rouser." But it appears that his asset to the U.A.W. as its chief officer about ends there.

John L. Lewis and his chief lieutenants are said to have recognized Martin's weakness long ago and would have rid themselves of him but for his strong personal following. He maintains a sufficient hold on the affections of thousands of union members that Lewis did not dare oust him at the Milwaukee convention last August and the C.I.O. high command is in a quandary as to what to do about him now. They would like to get him to surrender his post in return for a position in the C.I.O. with a high-sounding name and perhaps a bigger salary than he now has, but in such position he would be relegated to unimportant activities.

Events of the past week have somewhat decreased chances of a permanent cleavage in the union. Factions within the U.A.W. withdrew their candidates for presidency of the newly-formed C.I.O. Michigan State Council at Lansing and all of them plumped for Adolph Germer, who is well known in C.I.O. circles as regional director and who has had long experience in union labor activities. He and John Brophy, right-hand man of Lewis, have made a start toward getting opposing groups together.

PITTSBURGH—The Steel Workers Organizing Committee "took it on the nose" when employees of the American Rolling Mill Co. at Butler, Pa., voted 1243 to 402 against naming the SWOC as their exclusive bargaining agent. The vote was a surprise to union officials who had thought that it might be much closer. The union feels that the disastrous outcome of this election may curb some of the hot heads within its ranks from going into action against steel companies before they are in a position to win.

LATE *NEWS* WIRES

BOSTON—Westinghouse spending $1,500,000 expanding New England production and service facilities. Firestone installing machinery for operation of former Fall River plant of American Printing Co.

DETROIT—Bohn Aluminum's 11-day strike ended Monday after management and union agreed to rewrite old contract for clearer understanding of regulations on seniority layoffs and grievance procedure.

WASHINGTON—British mission surveying U. S. airplane market is secretive because State Department fears congressmen may agitate growing protest against export of military secrets. Britain reported planning to place orders with Canadian airplane plants which will need machine tools to expand capacity.

ROCHESTER—Local machine shops running three days a week on single shift with half force except several large companies which are operating full time with reduced force staggered to provide as much work as possible for everybody. Builders of chemical plant equipment and laundry machinery in better shape than most companies.

PITTSBURGH—British reported to have placed order for very long steel shafting for armor plate planers.

SAN FRANCISCO—Western Pacific Railway modernizing Sacramento shops and adding new building for maintenance facilities costing $200,000.

WASHINGTON—Southern Railway has bought 5,550 freight cars subject to I.C.C. approval. Biggest order went to Pullman-Standard at Birmingham which will supply 2,000 box cars. Mount Vernon Car Mfg. Co. and American Car & Foundry will each build 1,250 cars.

Gear Makers Meet at Niagara Falls; Elect Howard Dingle President

NIAGARA FALLS, ONTARIO, CANADA—Howard Dingle, president, Cleveland Worm & Gear Co., was elected president of the American Gear Manufacturers Association at the 22nd annual meeting held at the Hotel General Brock, April 25-27. Other officers and new members of the A.G.M.A. executive committee are listed on this page.

A record attendance took advantage of an extremely well balanced program of technical sessions and enjoyed the beautiful setting on the Canadian side of the Falls. Papers contributed by members and guest speakers were presented at three morning and one evening sessions. Tuesday night was set aside for the A.G.M.A. annual dinner which included the installation of officers.

"Long Time Program for the Business Enterprise" was the topic of an address by F. H. Fowler, Foote Bros. Gear & Machine Co., who outlined the many considerations needing attention in the conduct of a successful manufacturing concern. Mr. Fowler described how each department should be set up as regards both personnel and equipment.

Professor Frank A. Mickle, University of Michigan, addressed the meeting on the subject, "The College Training of Mechanical Engineers" in which he outlined courses of instruction particularly as used at his own university.

A feature of the meeting was the one-act play which followed the address of H. N. Mathias, of Westinghouse, on "Rates of Depreciation." The dramatic emphasis put on this rather unromantic subject was due entirely to the unexpected theatrical talents of members in the cast of the skit. Stars of particular brilliance were George L. Markland, Jr., Philadelphia Gear Works and A. A. Ross, General Electric Co.

Another entertaining event of the evening session was a talk on "Industrial Photography" by J. L. Boon, Eastman Kodak Co., which included a showing of high-speed moving pictures. Mr. Ross displayed his pictures of previous A.G.M.A. meetings.

G. P. Maurer, Falk Corporation, made a valuable contribution to the Association's technical data in his paper on "Recent Durability Tests of Helical Gears." Among the many conclusions made by Mr. Maurer was that hardened gears often had concentrated loading caused by distortion which lead to breakage by fatigue at loads successfully carried by softer gears which could be cut after heat-treatment.

"Couplings and Their Influence on Gear Operation" was presented by W. P. Schmitter and E. L. Davis, both of the Falk Corporation. In a comprehensive appraisal of the many factors involved, the authors demonstrated the great reduction in tooth pressures and shaft stresses obtainable through the use of resilient couplings with systems having shock loading.

H. S. Card, development director, Electric Welding Section, National Electrical Manufacturers Association, gave a talk on "Gear Welding —A Look Ahead." He showed that in certain instances arc-welded construction would result in lighter, more powerful units at no increase in cost.

In his paper on "Phenolic Laminated Materials," H. R. Moyer, application engineer, Westinghouse Micarata Works, outlined the development of plastic materials for gear use and displayed a number of products made of micarta.

Describing early uses of silent chain and its widened field in modern power transmission, J. M. Bryant, Link-Belt Co., addressed the meeting on "Silent Chain—Its Application to the Drive Problems of Industry."

C. W. Bohmer, Jr., Standard Oil Co. of New Jersey, spoke on "Gear

Howard Dingle faces the job of bettering the excellent year of his predecessor

New A.G.M.A. Officers

PRESIDENT

Howard Dingle
Cleveland Worm & Gear Co.

VICE-PRESIDENT

C. F. Goedke
Ganschow Gear Company

TREASURER

J. Harper Jackson
Jackson Gear Co.

MANAGER-SECRETARY

J. C. McQuiston

Executive Committee Members

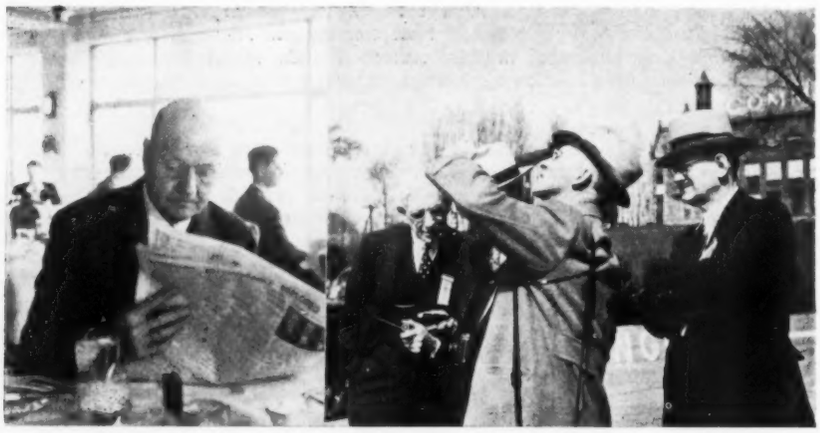
*** L. R. Botsai**
Westinghouse Electric & Mfg. Co.

Paul Christensen
Cincinnati Gear Co.

W. P. Schmitter
Falk Corporation

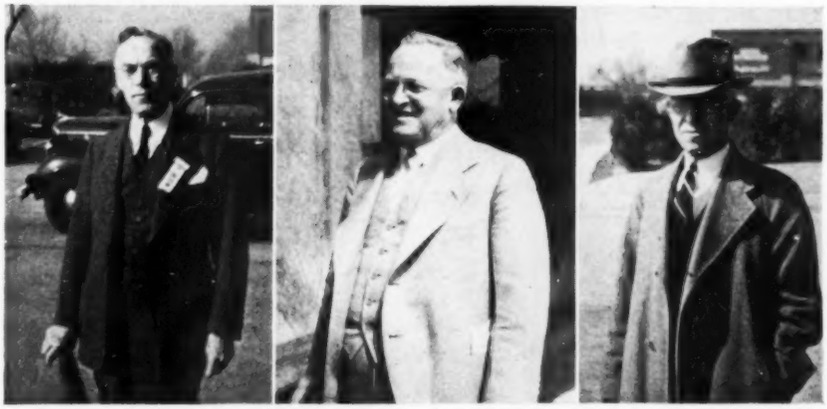
*** J. Harper Jackson**

*** Reelected**



Left—H. D. Randall catches up on the news. *Right*—Douglas Hamilton sights through an exposure meter while A. G. Brown looks on. In the background is W. G. Fisher

Left—R. S. Drummond's paper on gear noise caused much discussion. *Right*—C. F. Goedke, Walter Henry and H. H. Kerr talk things over



Left—F. B. Drake traveled from California. *Center*—J. C. McQuiston is cheered by a record attendance. *Right*—I. E. Rogers sets out for the Falls

Lubrication." He told of the characteristics of lubricants and especially the relation of viscosity to gear applications.

A paper, "Sound Testing," by R. S. Drummond, Jr., president, National Broach & Machine Co., analyzed types of noise and their causes. Mr. Drummond stressed the need of eliminating gear noises at their source by the careful selection of cutting and heat-treating methods.

In his "Theoretical Comparison of Ball and Roller Bearings" Thomas Barish, Marlin Rockwell Corp., gave the fundamental differences between these two kinds of anti-friction bearings. He explained load carrying characteristics, area of contact, slippage, lubrication and other factors that affect their performance in practice.

A.G.M.A. technical committees showed marked progress in their various activities. Particularly noteworthy was the work of the Speed Reducer Committee whose report on "Planetary and Spur Gear Speed Reducers" was adopted as recommended practice. Another outstanding report was that of the Helical Gear Committee which submitted findings on three separate studies: "Investigation of Contact Stresses at Region of Maximum Intensity;" "Contact Length Determinations for Application to Durability Ratings of Helical Gears;" and "Durability Formula Analysis for Internal Helical Gearing."

Engineering Council Sponsors Public Forums

WASHINGTON—To develop a wider public understanding of the relationship of enginers to economic and social questions, the American Engineering Council will conduct a series of public forums at which national problems and trends will be discussed by outstanding engineers, economists and industrialists. The Engineers Club of Philadelphia will be the place for the first gathering on May 13. The program is:

2:00 p. m. "Labor Policy and Prospects of Employment" by Dr. Leo Wolman, professor of economics, Columbia University.

3:45 p. m. "The Contributions of Technology to Employment" by Leonard J. Fletcher, assistant general sales manager, Caterpillar Tractor Co.

7:30 p. m. "Engineers, Economists and Politicians" by Dr. Alexander Sachs, economist and director of research, the Lehman Corp.

8:15 p. m. "Relation of Technology to Finance" by William J. Kelley, president of the Machinery & Allied Products Institute.

Reprints Available of "Foreman's Daily Dozen"

Several orders have been received for reprints of the "Foreman's Daily Dozen" (*AM*—Vol. 82, page 218) which showed in pictorial form the most needed qualities for good foremanship. A limited number of copies are available at $8 for fifty, $12 a hundred.

Machine Shop Practice Meeting at Rochester

NEW YORK—Screw machine products, gears, inspection, steel castings, apprentice training and trends in shop practice and drafting will occupy the attention of those who participate in the Rochester meeting of the Machine Shop Practice Division, American Society of Mechanical Engineers. The meeting will run from May 10-12, with headquarters at the Sagamore Hotel. The American Foundrymen's Association is cooperating with the A.S.M.E.

Technical sessions will take place mornings and an exceptional group of Rochester metal-working plants will be inspected during the afternoons. These firms are: Camera Works, Eastman Kodak Co.; Gleason Works; Bausch & Lomb Optical Co.; Taylor Instrument Companies; American Laundry Machinery Co., and The Consolidated Machine Tool Corp. The program follows:

TUESDAY, MAY 10

9:00 a. m.

Gears and Machine Tools Session

"A New Method of Producing Screw Machine Products," by E. W. Brinkman, sales engineer, Davenport Machine Tool Co.

"Industrial Applications of Spiral Bevel and Hypoid Gears," by Allan H. Candee, mechanincal engineer, Gleason Works.

8:00 p. m.

"Inspection Procedure," by Carl L. Bausch of the Bausch & Lomb Optical Co.

WEDNESDAY, MAY 11

9:00 a. m.

Foundry Metals Session

"Engineering Approach to the Use of Steel Castings," by F. A. Lorenz, Jr., vice-president, American Steel Foundries.

"Developments in the Engineering Possibilities of Gray Iron Castings," by A. C. Denison, president, Fulton Foundry & Machine Co.

"Malleable Iron Castings for Engineering and Miscellaneous Uses," by Enrique Touceda and J. H. Lansing, consultant and shop practice engineer, Malleable Founder's Society.

6:30 p. m.

"Apprentice Training," by George B. Heddendorf, education department, International Business Machines Corp.

Toastmaster: Kenneth H. Condit, editor, *American Machinist*.

THURSDAY, MAY 12

9:00 a. m.

Methods Session

J. R. Weaver, presiding officer
Secy., Machine Shop Prac. Division

"Trends in Shop Practice and Drafting," by Wm. L. Bond, general superintendent's office, General Electric Co., Schenectady.

"What's New in Electrical Equipment for Manufacturing Operation," by W. D. Turnbull, manager, machinery electrification section, Westinghouse Electric & Mfg. Co.

Automotive Research Men Discuss Protecting Metals Against Corrosion

DETROIT—Representatives of Ford, General Motors, Chrysler, and Battelle Memorial Institute cooperated last week at the third annual spring meeting, Detroit Section, American Society for Testing Materials, in presenting a complete symposium on "Protecting Metals Against Corrosion."

H. W. Gillett of Battelle Memorial Institute led off with a paper on "Corrosion Resistant Alloys," which emphasized that "corrosion resistance" is entirely too general a term and needs interpretation in the light of the elements to which the material is to be exposed.

In general, he said, non-corrosive alloys are those which—in the element to which they are exposed—naturally form a non-metallic coating to protect the metal beneath. The addition for instance of 0.20 copper or 0.10 phosphorus, or both, will protect steel against corrosion in air—after corrosion itself has formed the coating—but will not protect steel in water, he pointed out.

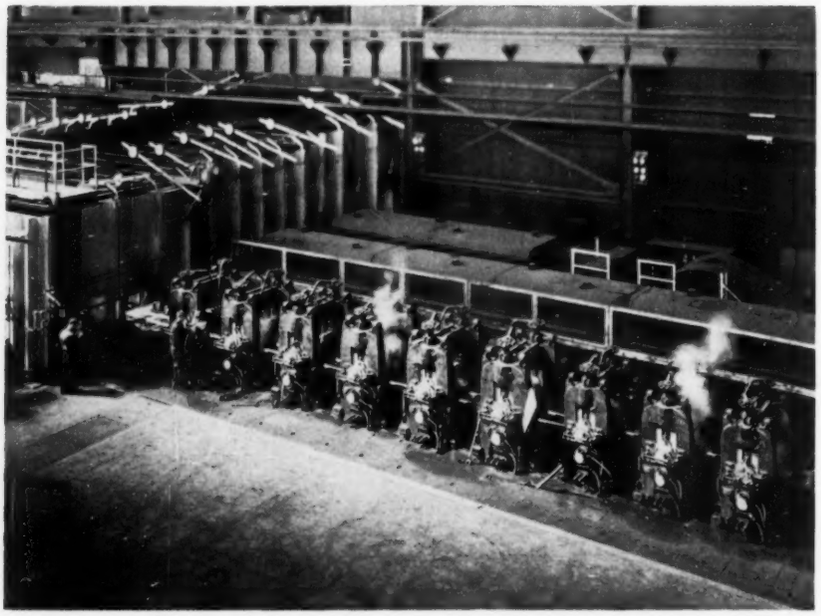
Tackling the second part of the symposium—protection of corrosion by the use of metallic coatings—Carl E. Heussner, materials engineer, Chrysler Corp., presented a paper analyzing virtually all present-day plating methods, giving chemical composition, necessary procedures, conditioning of surfaces, polishing, current density, cathode efficiency, concentration of (pH). In addition, Mr. Heussner covered methods of applying metallic coatings by cementation (sherardizing and calorizing), by immersion (galvanizing) and by spray gun.

In the third paper, "The Pre-treating of Metals," Ralph Wirshing, Research Laboratories Division of G.M., pointed out that in the ten years since 1928 cost of rust-proofing of metals by pre-treating before painting has been cut 80 per cent, and time reduced from 1 hr. to 1 min. He forecast even speedier processes.

RALPH J. WIRSHING

CARL E. HEUSSNER

J. L. McCLOUD



Bethlehem has opened a 56-in. hot strip mill and a continuous rod and bar mill at Sparrows Point, Md. Roughing stands in the bar mill are shown

Completing the symposium, J. L. McCloud, metallurgical chemist, Ford Motor Co., analyzed the field of "paints" in a paper on "Organic Coatings." Mr. McCloud said that all paint constituents — pigment, binder, thinner, and occasionally a drying catalyst—must be taken into consideration in studying paints for provision of corrosion resistance. Among recently developed thinners Mr. McCloud mentioned a hydrogenated naphtha of good solvency and a liquid sulphur dioxide.

Election of T. A. Boyd, Research Laboratories Division, General Motors, as chairman of the Detroit Section, A.S.T.M. for the coming year, was announced at the meeting. New vice-chairman is J. L. McCloud, with C. H. Fellows of Detroit Edison as secretary. W. H. Graves, metallurgist, Packard Motor Car Co., and 1937-8 chairman, presided at the meeting.

DETROIT LETTER

Major labor rumpus not brewing, despite strike troubles . . . Shifting of supervisors to production jobs and wage reductions cause much friction . . . 1939 model changes less than expected . . . F.T.C. lays down rules for regulating auto industry

DETROIT—Newspaper reports of a dozen or more strikes the past ten days in automobile plants or in factories supplying the automotive industry might lead one to the erroneous belief that another major labor rumpus, like that early in 1937, is brewing. Actually that isn't the case. It is true that the situation may get worse before it gets better. Nevertheless, a "showdown" doesn't appear imminent at the moment.

There are a number of developments which have made for trouble: (1) while the U.A.W. international union apparently has improved its finances with outside loans, its locals are hard up for cash; (2) with car assemblies at a low level, it has been necessary for many plants to transfer key men from second and third shift supervisory jobs to production operations, thus resulting in the layoff of production workers or in failure to rehire production workers for that task; (3) attempts to unionize white collar workers, which led to a short-loved strike at Kelsey-Hayes; (4) wage reductions, especially those growing out of the shifting of older employees to lower-rate jobs in preference to laying them off; (5) inability of the U.A.W. to control hot-heads who force precipitate action by locals; (6) differences of opinions between workers and management regarding the extent to which share-the-work plans should be followed; and (7) the question of seniority ranking of union shop stewards.

Trouble at Buick and Chevrolet was caused by increasing hours worked instead of spreading work among more men.

Regarding shop stewards, the union took the position in some cases that they, by virtue of their union responsibilities, should be given seniority over older workers of higher efficiency rating. Managements demurred. It was this type of union-management clash that led to trouble at Detroit Molding Co.

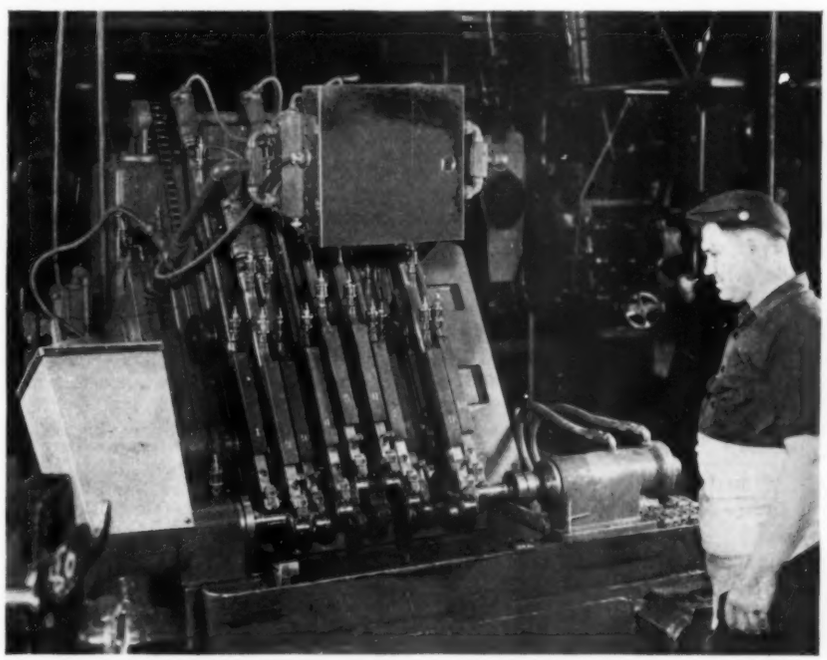
Settlement of the Gar Wood strike, precipitated by wage reductions, brought into being the first profit-sharing scheme in a U.A.W. factory (20 percent of profits to go to employees) and substitution of straight piece rates for a group bonus system. It is the first time that the union has assented to elimination of the minimum hourly guarantee for production workers.

Unless the U.A.W. backs down, a showdown is likely to come with the automotive industry on hours and wages. Car makers are determined to reduce manufacturing costs by next fall and are bringing more price pressure to bear on the parts industry than almost ever before. The parts industry is fighting wage reductions, but competition of outlying non-union lower-wage shops may break up the coalition of "stand-patters."

Production and sales of cars have picked up somewhat, but the improvement is no more than seasonal and mostly not that. May output will be close to the April volume. There are no high pressure sales campaigns and seemingly there won't be any.

Changes in 1939 models will be somewhat less than originally planned. Until the present uncertainty about labor is dissipated, new building and plant expansion are being held up. The industry is swinging around to the idea that it may have to decentralize further. A major question is whether to decentralize by means of a fairly integrated automotive plant (like Chevrolet's Buffalo plant) or by car parts (like Chrysler's Kokomo transmission plant and Ford's small plants).

Challenging the labor situation in interest has been the dealers' association meeting and the Federal Trade Commission hearings on a code of fair competition. In its projected code of rules, the F.T.C. banned the fixing of used car allowances. Dealers, of course, would like such price fixing. After the F.T.C. sets up its code for the industry, it will give everybody a chance to vote on it before making it mandatory. It appears, however, that the industry is going to be regulated by the F.T.C. whether it likes it or not.



SURFACE HONING—Chrysler is said to be the first to introduce equipment for this new process. Plymouth crankshafts are given a surface flawless within six one-millionths of an inch with this automatic honing machine

WATCHING WASHINGTON

Bill for educational munitions orders, calling for ten million expenditure over five years, not expected to pass this session . . . Republican switch may aid passage of wages-hours bill . . . Britain to buy 200 or 300 American airplanes

McGRAW-HILL WASHINGTON BUREAU
(*Paul Wooton, Chief*)

WASHINGTON — Again, as many times in the past 20 years, a bill proposing educational orders for special munitions is before Congress. And again, as always, the controversial question is whether to relax the law requiring bidding on procurements. The War Department cannot ask for bids, because educational orders actually would be fees paid to manufacturers for time spent breaking in their plants and personnel to do special jobs. And those jobs would not mean production on which a profit could be made. Yet Congress feels that negotiated contracts would set a bad precedent, and prejudice the public interest. It is sure to challenge the bill in debate.

Congress to Move Slowly

Two million dollars a year for five years would be spent out of War Department annual appropriations, according to the bill. So money is not a consideration. But Congress is not inclined to settle in haste the important point of policy involved. It seems unlikely any action will be taken this session. The bill is essentially like others that have been offered. The only reason why action might be expected is that the country is much more defense-minded today than at any other time since the world war. Most experts here believe educational orders eventually will be authorized, but they won't guess when.

The current bill was offered by Rep. J. Joseph Smith of Connecticut. The committee report argues that the War Department should not be allowed to disregard the bidding statute, but asks for exceptions under spending limitations and upon approval of each order by the President. It is contended the Department must either build up a reserve of all types of munitions or equip and train arsenals and private plants in peacetime. General Malin Craig placed a letter in the report contending that manufacturers in the industrial mobilization program have only "paper knowledge" of the articles they will have to build in emergency. Practical experience can be gained only by actual production of the materials, he wrote. It was General Craig, hoping to allay the fears of Congress, who suggested spending $1,000,000 a year out of funds rather than asking for $2,000,000 appropriations. Hon. Louis Johnson, Assistant Secretary of War, is speaking publicly in favor of the measure, urging its enactment this spring.

Although the house rules committee has refused by an 8-6 vote to report the wages-hours bill, Mrs. Norton says she may petition again. This may be only a threat. It must be rememebred, however, that the bill was released once to the House for a vote, and Washington politicians are convinced that it can be passed again. If so, they believe that it will be a walk-away.

A group of republicans will back the bill, because it is written by the AFL, carries no regional differential, and they think it will stop the flow of industry to the south for low wages. If the bill passes the House it will face a fight in the Senate, which let the Black-Connery bill through because of its wage differential provision.

Threat to British Labor

The British move to buy American fighting airplanes is partly genuine and partly a threat at English labor unions which have been using their strategic position to enforce their demands at a time when Britain is in the midst of an armament program. Up to 200 or 300 bombers and "fighters" probably will be bought in this country. The delegation is touring American plants now. Much will depend on assurance that manufacturers can deliver in a matter of months. Only three or four companies are reported in a position to make such haste; Glenn L. Martin and Lockheed are among those mentioned. Of course, the British don't want obsolete equipment, although they could use a little to advantage and could convert a few commercial jobs. Our laws forbid export of late designs. The State Department would like to relax the law in favor of Britain, but can't well do that under present circumstances. The fighting-cock powers already accuse France, United States and Britain of cooperative armament planning.

Two bills introduced in the House by John M. Costello, sponsored by some aircraft manufacturers, would remedy serious procurement difficulties for both manufacturers and government without altering the Procurement Act of 1926. One bill would permit a Department to contract for development work on cost-without-profit-plus-a-fixed-fee basis. The other would recognize the design rights of the manufacturer and compensate him on a reasonable basis. The Department could expropriate any design. Failing agreement on value, the vendor and the Department could ask for arbitration, or the vendor could sue in the Court of Claims. Reports are awaited from the Army and Navy.

REAL AIMS

New Deal objectives will not be changed, despite the President's approval without study of the letter signed by 16 outstanding executives in business and finance. Two concrete proposals in the letter were that the New Deal stop experimentation, and that it permit some sort of cooperation between government and business which would "short-circuit" the present anti-trust policy. Two days after the President approved without reading this "round robin," the new trust buster, Thurman Arnold, made a remarkable speech in New York showing the real Roosevelt aims against monopoly. Mr. Arnold seems to have little regard for the proposal that independent investigations be made of suspected abuses instead of having grand juries inquire into abuses prior to prosecution.

First large pipe mill placed in service in seven years, Youngstown Sheet & Tube's improvement program just completed includes this mill for making 4½–14 in. seamless pipe. New piercing units hold closer tolerances

PERSONALS

ROY E. ADAMS has been elected chairman of the board of the J. D. Adams Mfg. Co., road building and maintenance machinery makers, Indianapolis. WILLIAM RAY ADAMS is president, and HOWARD R. MEEKER, is executive vice-president.

H. KIRKE BECKER, has been elected president of the Peters Machinery Co., Chicago. Mr. Becker was formerly vice-president and general manager.

HARRY F. BOE, has been made manager of the Service Department, Westinghouse Electric & Mfg. Co. He succeeds W. K. DUNLAP, assistant to the vice-president, formerly in charge of the department, who retires.

JAMES R. DUNSFORD has been made president and director of the Wilson Foundry & Machine Co., Pontiac, Mich. He succeeds CHARLES E. WILSON who remains as a director.

FREDERICK D. FOOTE has resigned from the United States Steel Corp. to become president of the Alloys Development Corp. of New York, in which he will be associated with BERAM D. SAKLATWALLA. The new company is a successor to the United States Rustless Steel & Iron Corp.

CHAUNCEY P. GOSS 3D, Waterbury, Conn., and PAUL D. FENTON, Thomaston, were elected vice-presidents of the Scoville Manufacturing Co. at the annual meeting April 18. FRANCIS T. REEVES, secretary for several years, was added to the board of directors, while all other officers and directors were re-elected.

CORTLANDT W. HANDY, president of Handy & Harman, New York dealers in gold and silver and makers of silver solders, has been elected chairman. He is succeeded as president by G. H. NIEMEYER.

WILLIAM RIEGG was named plant superintendent, Nash-Kelvinator Corp., Racine, Wisconsin, branch, to succeed W. G. HELBER, resigned.

STEVENS A. BENNETT was made chairman of the board and general manager, Wilson & Bennett Mfg. Co., steel container specialists, Chicago. HARRY M. GUSTAFSON was made president.

E. H. JONES, president of E. H. Jones Machinery Co., London, and KURT RACHWALSKY of his staff, arrived in New York on the *Queen Mary* last week on a business trip. They attended the Chicago convention of the National Machine Tool Builders' Association.

C. R. PHILLIPS, president, Automatic Products Corp., Chicago, has succeeded VINCENT BENDIX as chairman.

J. C. WATTLEWORTH, formerly factory manager of the Cleveland Automatic Machine Co., is now vice-president in charge of manufacturing.

H. A. WOOFTER has been made sales manager of the Progressive Welder Co., Detroit. Mr. Woofter was formerly chief engineer for the Federal Welder & Machine Co.

GEORGE M. VERITY, chairman of the board, American Rolling Mill Co., attained his 50th anniversary in the steel business on April 21. It is said that he has had a longer record of continuous service as chief executive of a major steel company than any other man now living. His service with the American Rolling Mill Co. as president and later as chairman encompasses the span of 38 years.

Exports of Machinery During March, 1938

	March 1938	February 1938	March 1937
Electrical machinery and apparatus	$10,017,653	$7,694,880	$9,325,955
Power generating machinery except automotive and electric	1,497,312	1,359,301	1,000,028
Construction and conveying machinery	2,669,622	1,832,824	1,365,809
Mining, well and pumping machinery	6,147,255	4,674,442	4,510,810
Power driven, metal-working machinery	8,297,396	9,459,830	4,497,750
Other metal-working machinery	656,671	353,865	479,913
Textile machinery	799,945	755,445	710,537

Exports of Metal-Working Machinery During March, 1938

	March 1938	February 1938	March 1937
Engine lathes	$510,655	$850,553	$209,729
Turret lathes	614,461	690,923	332,128
Other lathes	62,392	287,521	160,026
Vertical boring mills and chucking machines	309,249	190,190	277,838
Thread cutting and automatic screw machines	279,855	513,032	208,768
Knee and column type milling machines	543,627	419,336	256,697
Other milling machines	528,237	775,607	347,361
Gear-cutting machines	229,185	309,043	255,206
Vertical drilling machines	132,997	193,960	74,117
Radial drilling machines	233,003	161,730	31,624
Other drilling machines	80,022	156,169	129,253
Planers and shapers	215,393	127,313	56,667
Surface grinding machines	132,782	199,631	145,511
External cylindrical grinding machines	410,700	605,488	113,211
Internal grinding machines	393,320	965,647	191,587
Tool grinding, cutter grinding, and universal grinding machines	265,651	340,035	152,439
Other metal grinding machines	277,890	240,510	68,075
Sheet and plate metal grinding machines	602,748	425,561	255,567
Forging machinery	331,784	356,247	326,612
Rolling mill machinery	1,302,494	788,020	204,952
Foundry and molding equipment	130,988	104,472	78,794
Other power-driven metal-working machinery and parts	709,963	758,842	621,589

Other Metal-Working Machinery

	March 1938	February 1938	March 1937
Pneumatic portable tools	$333,285	$161,118	$121,856
Portable and hand and foot operated metal-working machines and parts	150,237	91,448	98,994
Chucks for machine tools	24,133	16,249	26,329
Milling cutters, machine operated threading dies and taps and similar machine operated metal cutting tools	78,213	42,494	178,012
Other metal-working machine tools	70,803	42,556	54,722

W. P. ANDREWS

WILLIAM P. ANDREWS has been appointed manager of sales, Cincinnati district, by the Carnegie-Illinois Steel Co. Mr. Andrews, now assistant manager of sales in the Chicago district, assumes the position made vacant by the recent death of LAWRENCE K. SLABACK.

T. LANE WATSON has been appointed assistant manager of sales, Chicago district, by the Carnegie Steel Co.

VICTOR A. HANSON, vice-president and chief engineer of the Power Transmission Council, has been transferred from Boston to Detroit where he will make a study of power transmission problems in the automotive industry.

SAMUEL C. EARLEY has been made manager of the Logan Gear Co., and the Bingham Stamping Co. plants to succeed V. R. DRUM, resigned.

OBITUARIES

GEORGE WESTBROOK, president of the Noble & Westbrook Mfg. Co., East Hartford, Conn., died April 12 at the age of 68. Mr. Westbrook organized the company in 1904 with RICHARD NOBLE to manufacture marking and stamping devices.

JOSEPH S. ADKINS, 49, owner of the Adkins Machine Co., Columbus, Ind., died recently.

GEORGE M. DIEHL, 67, head of the George M. Diehl Machine Co., Wabash, Ind., died recently. He was the former president and treasurer of the National Association of Manufacturers of Woodworking Machinery.

JOHN JOHNSON, 46, manager of the production department of the Thew Shovel Co., Lorain, Ohio, died recently.

MICHAEL J. KIST, manager of sales, Lorain Div. of Carnegie-Illinois Steel Corp., died April 18 at Johnstown, Pa.

EARL R. MULDREW, president of the Metal Finishing Products Co., died recently in suburban Los Angeles at the age of 44.

BUSINESS ITEMS

Machinery Sales Co., a California corporation, has been organized to take over the personnel and organization as well as the agencies formerly sold by the Herberts Machinery Co., Los Angeles; address will be 4439 Santa Fe Ave. The Herberts Machinery Company has been in business for approximately 22 years and Mr. Herberts has gone into the manufacture of aircraft parts in a separate corporation known as the Herberts Engineering Corp., which has no further connection with the machine tool business.

The personnel of the organization consists of D. N. MACCONEL, president, who has been associated with the Herberts Machinery Company for 14 years, the last seven as vice-president and sales manager; S. W. CLAWSON, secretary; N. TROOP, treasurer. Other members of the group include former Herberts salesmen: T. S. SMITH, H. A. PERRY, M. FRANK STRAUSS, R. W. BLACKMAN, D. B. JELLEY; former shop superintendent J. MUELLER, and former service manager JOHN BLUTH.

The Master Tool Company, 137 Oliver St., Boston, Mass., makers of multi-swivel vises, has appointed The Master Tool Co., 1 North LaSalle St., Chicago, as exclusive distributor for Illinois, Michigan, Wisconsin, Ohio, Indiana, Kansas, Missouri, Iowa and Minnesota. The manager will be H. C. DEVEREUX.

The Master Tool Co. of New York, 10 W. 47th St., New York City, will handle the sales for New York, New Jersey and Pennsylvania and will be managed by WOODBURY A. PEABODY.

The sales in the New England states is now headed by JOHN P. MORSE from the home office in Boston.

Fansteel Metallurgical Corp. has appointed Michigan Tool Co., Detroit, as sales representatives for Tantaloy hard cutting metal and Tantaloy tipped tools.

The Harnischfeger Corp. has appointed R. C. VAUGHN as sales engineer in the New York office. He has had 20 years experience in sales of hoists and overhead traveling cranes in New York.

The High Speed Hammer Co. Inc., Rochester, N. Y., makers of riveting machinery and precision drilling machines, has appointed the E. L. Essley Machinery Co., Chicago, as representative in Western Michigan, Illinois, Wisconsin, Iowa and Nebraska.

Detroit Rex Products Co., Detroit, manufacturers of degreasing machines, solvents, cleaners and strippers, has opened a branch office at 5905 Pacific Blvd., Huntington Park, Calif. A warehouse in Los Angeles will carry stocks of solvents.

A. Milne & Co., whose offices have been located for 51 years at 141 Milk St., Boston, are moving to 109–111 Broad St., Boston, where they have opened offices and a tool and drill steel warehouse.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has been selected by the Franklin Institute, Philadelphia, to display its Model 25 injection molding press, in conjunction with a special exhibit of cellulose products. The press will mold the medallion commemorating unveiling a statue of Benjamin Franklin at the formal dedication of the Franklin Memorial at the Institute.

The Whitehead Metal Products Co., subsidiary of the International Nickel Co., has opened a warehouse and assembly plant at 287–303 West Tenth St., New York, N. Y. The company's new building which occupies a block, provides 150,000 sq. ft. on four floors.

The Independent Pneumatic Tool Co., Chicago, Ill., has opened a sales-service branch at 6200 E. Slauson Ave., Los Angeles, in charge of B. J. HERRON.

The Western Pacific Railroad Co. will build a new railway shop building of structural steel and reinforced concrete in Sacramento, at a cost of $200,000.

McClaran Oil Tool, Inc., has been incorporated in Los Angeles County, with a capital stock of $50,000.

The D. O. James Mfg. Co., 1120 W. Monroe St., Chicago, manufacturer of a complete line of speed reducers, gears, sprockets and couplings, is this year celebrating the 50th anniversary of the first efforts of D. O. JAMES in the manufacture of gears. The D. O. James Machine Co. was founded in 1888, and the D. O. James Manufacturing Co., not a direct successor, was incorporated in 1905.

MEETINGS

AMERICAN ELECTRO PLATERS' SOCIETY. 1938 convention, June 13–17. Hotel Schroeder, Milwaukee. W. J. R. KENNEDY, executive secretary, 90 Maynard St., Springfield, Mass.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer convention, June 20–24. Washington, D. C. H. H. HENLINE, national secretary, 33 West 39th St., New York, N. Y.

AMERICAN IRON & STEEL INSTITUTE. Annual meeting, May 26. New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Machine shop practice meeting, May 10–12. Hotel Sagamore, Rochester, N. Y.

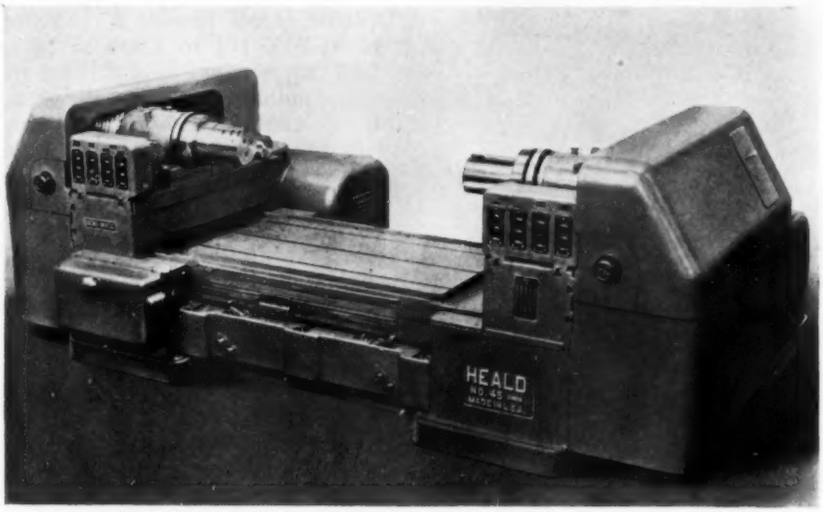
AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 27-July 1. Chalfonte-Haddon Hall, Atlantic City, N. J.

NATIONAL ASSOCIATION OF PURCHASING AGENTS. Twenty-third annual international convention, May 23–26. Jefferson Hotel, St. Louis, Mo.

NATIONAL METAL TRADES ASSOCIATION. Fortieth annual convention, May 25–26. The Biltmore Hotel, New York, N. Y. HARRY S. FLYNN, secretary, Peoples Gas Bldg., Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS. Summer meeting, June 12–17. The Greenbrier Hotel, White Sulphur Springs, W. Va. JOHN A. C. WARNER, secretary and general manager, 29 West 39th St., New York, N. Y.

SHOP EQUIPMENT NEWS



Heald No. 45 Double-End "Bore-Matic"

Designed and built especially for borizing large spindle carriers, work heads, headstocks, driving heads and similar machine tool parts, the No. 45 double-end "Bore-Matic" boring machine offered by The Heald Machine Co., Worcester, Mass., has capacity for mounting from three to seven heads, depending on their size, on each bridge. Heads are driven by V-belts and speeds easily can be varied by changing pulleys. Table is 104 in. long and 36 in. wide and is provided with a 54 x 28 in. scraped pad. This table is only 22 in. from the floor, thus facilitating set-up operations. Table is driven by a hydraulic system which provides a wide range of feeds.

At each end of the machine boring heads are driven by d.c. motors which, with their own jackshafts, are mounted on separate sub-bases at the rear of the machine. Motors are of the variable-speed type and are controlled by rheostats at the front of the machine. Starting and stopping the boring heads is controlled by pushbuttons in individual control panels on the bridges. These pushbuttons allow the boring heads to be placed under automatic control or to be jogged during set-up. The control panels also provide pushbuttons for controlling the main drive motor and starting, stopping and reversing the table. Both bridges are set back on the pads of the machine base to give a distance of 70¾ in. between heads. Net weight of machine equipped with four heads is 19,590 lb. Stroke is 30 in. Floor space required is 84 x 144 in.

Schatz-Weingarten Friction Press

Horizontal flywheel of the improved Schatz-Weingarten friction roller spindle press, announced by The Schatz Mfg. Co., Poughkeepsie, N. Y., now runs close to the head of the frame without moving up and down and is rigidly tied to the screw, which has one-sided trapezoidal teeth. On the under side of the flywheel are two cut grooves concentric with each other in which are engaged friction rollers. Power is derived from an inverted flange-type motor. On the driving end of the motor is connected a friction roll. Around this driving friction roll is driven two other friction rolls shunted from one groove to the other, thus providing the rapid downward or blow movement of the slide and then the slower upward movement. To the slide is attached a cylinder which completely covers and protects the screw, so that no foreign matter can get into the thread, even when the slide is in its lowest position. Elimination of leather belting on the periphery of the flywheel is claimed to increase the blow energy.

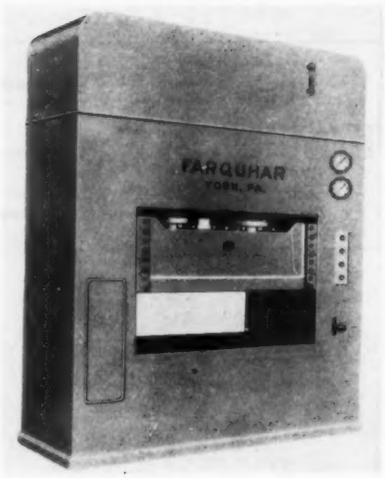
These presses are available in capacities ranging from 40 to 2200 tons pressure and having speeds of 50 to 13 strokes per min., according to size. Maximum stroke ranges from 7 to 31 in., depending on the size of the press. In each press, there are two shrunk steel tie-rods running through the entire frame, one on each side.

Farquhar 300-Ton Hydraulic Press

Developed for metal stamping and forming operations, this 300-ton hydraulic press, offered by A. B. Farquhar Co., Ltd., York, Pa., has a maximum stroke of 24 in. and a 48 in. daylight. Bed dimensions are 76 in. right to left and 56 in. front to back. Bed is designed to permit installation of hydro-pneu-

matic cushions. Slide is guided against steel housing by means of adjustable bronze-lined guides. Knockouts can be incorporated in the slide when required.

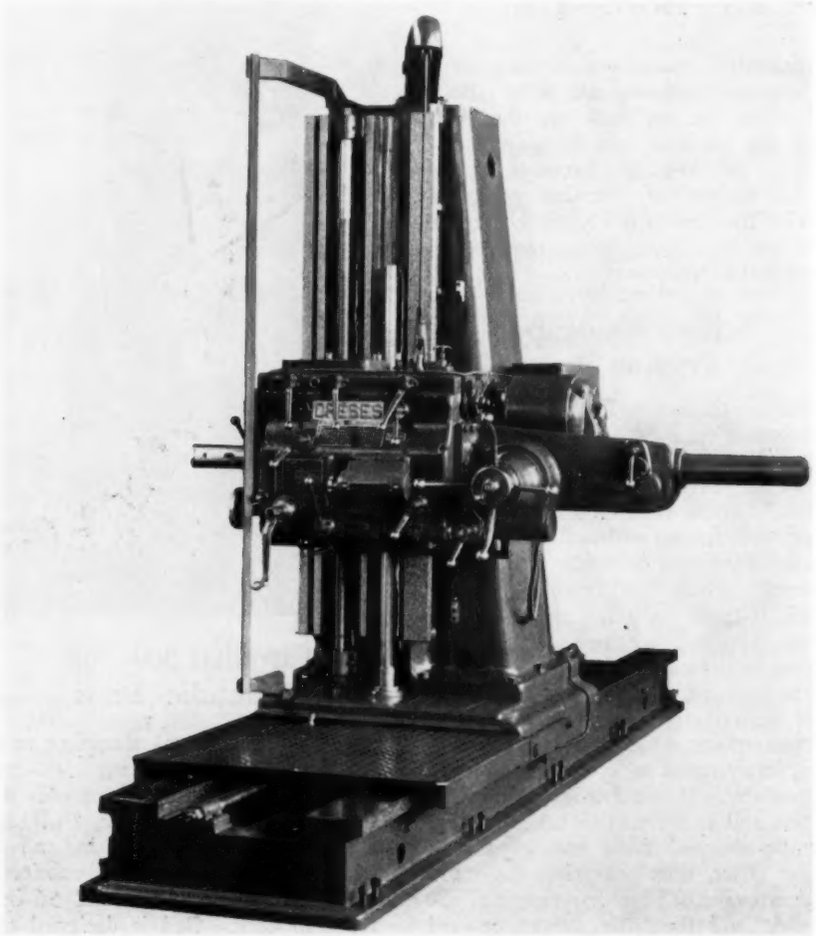
Tension is taken by four rods which are shrunk in, maintaining permanent alignment of the machine under varying conditions. Rams are of a telescopic type, permitting fast positive approach under pressures up to 75 tons. Rapid approach speed automatically is reduced when the main rams are operating under pressure. Change in speed can be controlled either by pressure or by the position of the slide. Working stroke is adjustable.



Dreses Improved Horizontal Drilling, Boring and Milling Machines

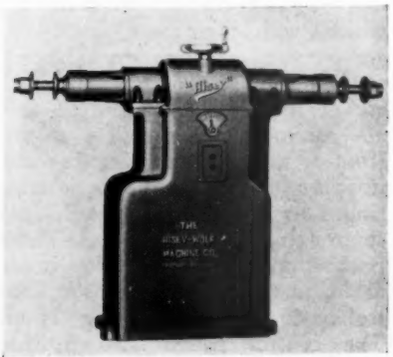
Spindle speeds as high as 1,420 r.p.m. are available with the horizontal drilling, boring and milling machines announced by the Dreses Machine Tool Co., Cincinnati, Ohio. The machine shown has a vertical travel of spindle head of 48 in. and a 120 in. horizontal travel of column. Standard spindle and column can be adapted to existing floor-type runways. Spindle head contains all spindle speed change gears, the feed change gears, feed distribution functions and a reversible flange-mounted motor. Full 30 in. spindle feed can be used at all speeds. Only 17 gears are used to secure the 24 spindle speeds and only four pairs are in mesh for any one speed.

Head is completely inclosed and all mechanism is oiled automatically from a positive-driven pump. Spindle is 3½ in. in diameter and is provided with eight boring and drilling feeds. Three ranges of spindle speeds provide a choice of 12 to 700, 16½ to 1,000 or 24 to 1,420 r.p.m. in 24 steps. There are eight milling feeds to the head and column for all types, while sixteen milling feeds are provided for the head, table and saddle of the compound-table type machine. Different sizes of these machines provide for a vertical travel of the spindle head of 24, 36, 48, 60 and 72 in. Column travel on runways ranges from a minimum of 24 in. to any maximum in increments of 12 in. Simple sliding tables mounted on a bed can be furnished in sizes ranging from 30 x 30 in. to 48 x 84 in. Stationary tables are available in various sizes and can be mounted on a bed plate or attached to the runway of a floor-type machine. Compound tables consisting of a standard table mounted on a saddle and having a working surface ranging from 38 by 60 in. to 48 x 72 in. can be furnished. Beds for these tables measure 36 in. across the ways and are available in 72, 96 and 120 in. lengths.

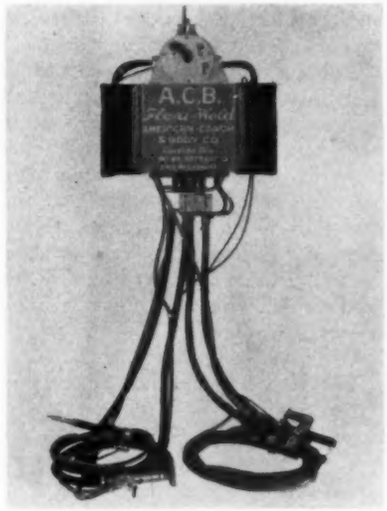


H.-W. Variable-Speed Polishing Lathe

Any desired spindle speed from 1,700 to 3,500 r.p.m. can be obtained by turning the hand wheel at the top of this variable-speed buffing and polishing lathe announced by The Hisey-Wolf Machine Co., Cincinnati, Ohio. Made in 3, 5, and 7 ½ hp. capacities, this machine

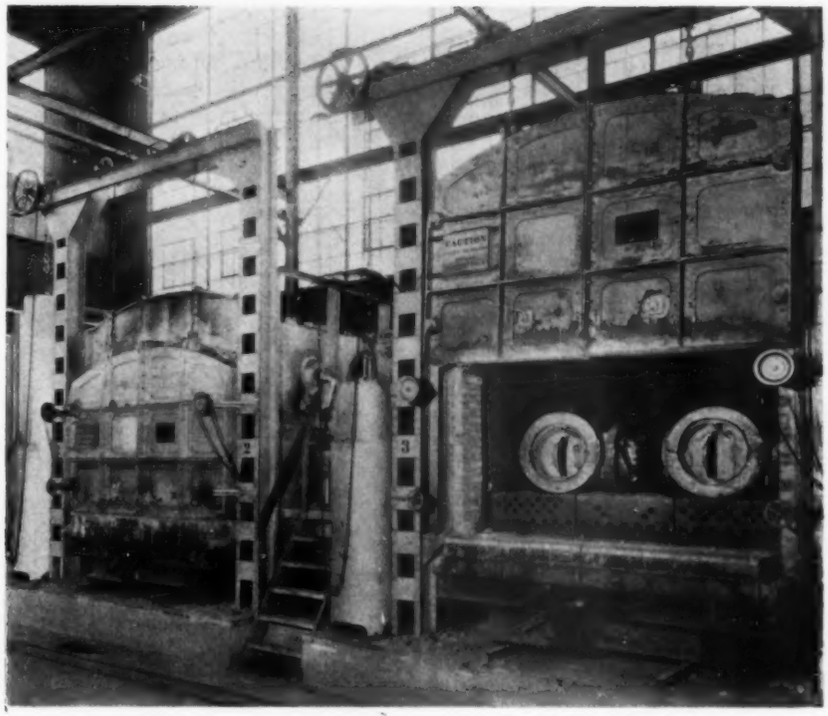


can be equipped with any standard NEMA motor of any electrical characteristics. Speed can be changed while spindle is in motion and also may be changed while the machine is under a working load. Approximately 11 sec. is required to change speeds from extreme low to extreme high, or visa-versa. Speed dial in front of the machine is direct reading, indicating the r.p.m. of the spindle.



A.C.B. "Flexi-Weld" Welding Units

The American Coach & Body Co., 9503 Woodland Ave., Cleveland, Ohio, offers the "Flexi-Welder" for use in auto body and truck fabrication and for other products that are fabricated from No. 16 gage or lighter sheet metal. The 900-lb. unit can be hung overhead on a trolley and the flexible, water-cooled cable leads permit the operator to work inside and outside of a body within a radius of 6 ft. from the flat electrode grounded on the opposite sheet. The unit consists of a specially designed transformer, having a 9-step heat regulator and an electronic timer with a magnetic contactor. Timer can be set at from 3½ to 50 cycles time duration. Separate twin electrodes or light-weight, hand-operated pincher guns, as shown at the right, can be provided. These pincher guns weigh approximately 10 lb. and can be adjusted for throat depth. Handle can be changed to suit operating conditions. Push guns, shown at the left, weigh approximately 4½ lb. and can be provided with various types of point holders and ground electrodes. Other gun equipment is available for specialized work.



Gas Machinery Company Offers Improved Car-Type Furnaces

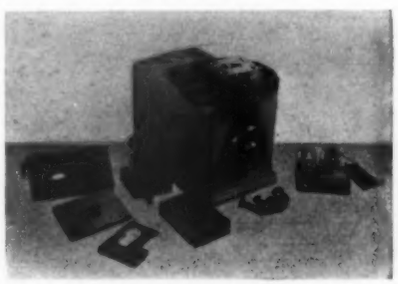
Car-type furnaces for annealing, normalizing and stress relieving of bulk material, offered by The Gas Machinery Co., 16100 Waterloo Rd., Cleveland, Ohio, now are equipped with a liquid seal which is claimed to provide a degree of control of both furnace temperature and atmosphere not obtained with previous designs. This seal is simple and completely automatic in its operation. It incorporates a trough mounted on the car under structure and extending entirely around its edge.

With the car outside the furnace, the trough normally is in its lower position. When the car is run into the furnace to its proper location, the trough automatically is raised with a positive mechanism actuated by contact with the front member of the car under-structure. This mechanism is supported by the furnace foundation, its only moving part on the furnace car being the trough itself. With the car in its proper position in the furnace, the door can be lowered and clamped to establish an air-tight seal.

Once the door has been sealed, it is necessary only to complete inlet and drain connections, and maintain a moderate circulation of water, oil or other liquid in the trough to keep the entire under structure of the car relatively cool and minimize liquid vapor formation above the seal. Such vapor as is formed is removed by syphon vent flues before it can enter the heating chamber. This combination of liquid seal and syphon vent flues is said to insure a tight seal between the car and the furnace without attention on the part of the furnace operator.

B.-S. Bench-Model Profile Grinder

Built with a precision spindle that revolves at 20,000 r.p.m. and is suitable for various sizes of grinding wheels, the bench-type vertical-spindle profile grinder offered by Boyar-Schultz Corp., 2110 Walnut St., Chicago, Ill., provides a sine-bar adjustment for the work table. This feature will give any angular



setting up to 5 deg. Diamond wheel dresser is furnished for positive attachment to the work table. Revolving spindle is adjustable to provide reciprocal movement in a vertical plane.

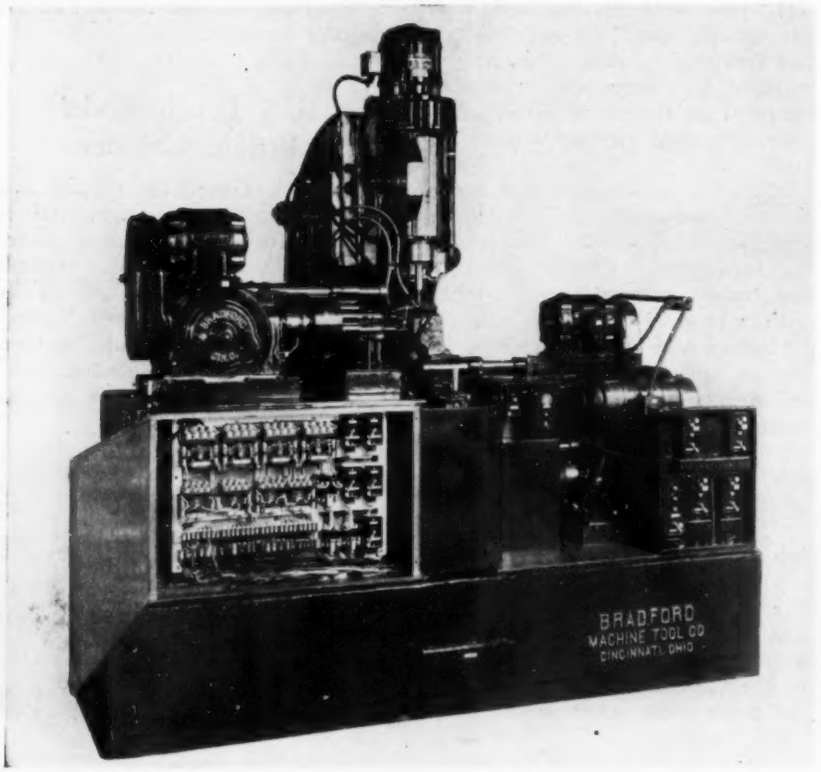
Specifications: height, 11¾ in.; bench space required, 10½ x 16½ in.; net weight, 90 lb.; motor required, ¼ hp., 3600 r.p.m.; diameter of table, 10 in.; height adjustment of table, 1¼ in.; maximum angle of table, 5 deg.; size of grinding wheels, ¾ in. maximum diameter.

Bradford Automatic Drilling Machine

Developed to perform several operations on an engine oil distributor body, this four-station automatic drilling machine developed by the Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio, consists of a box-type base on which are mounted, in various positions, five automatic units and a four station, automatic index, ferris-wheel type drum on which are mounted cam actuated fixtures holding one part at each station. Control of the machine and synchronization of its movements are by electrical means through the use of limit switches, solenoids and relays, most of which are mounted on a control panel built into the machine and protected by a heavy cover. Use of electrical control has permitted the use of a modification of the Geneva index which permits the 400 lb., 24 in. diameter turret to index through a 90 deg. arc in one second without jarring or pounding. Machining cycle for the machine is 8 sec. Operating at 85 per cent efficiency, this machine produces 350 pieces per hour.

"Multi-Hi Speed" Floor-Stand Grinder

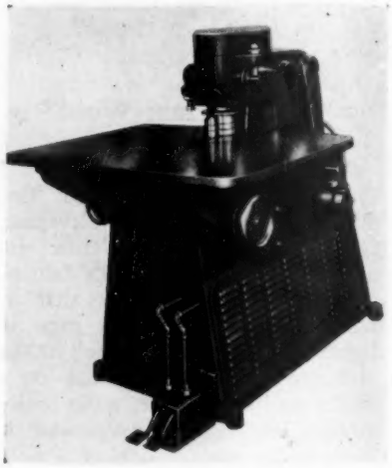
"Multi-Hi Speed" stand grinders, announced by Hammond Machinery Builders, Inc., Kalamazoo, Mich., are protected to insure against overspeeding the grinding wheels. It is not necessary to disturb the main spindle or bearings when replacing belts. Wheels ranging from 18 to 30 in. in diameter can be used and motors ranging from 10 to 25 hp. can be mounted in the base. Changing speeds is effected quickly and it is claimed that efficient surface speed can be maintained.



Quickwork Stamping Trimming Machines

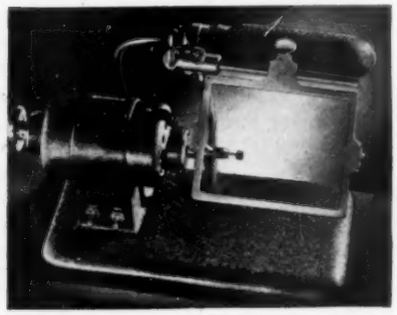
Trimming, beading, flanging and forming operations can be performed on stampings by this trimming machine announced by the Quickwork Co., 900 N. Spaulding Ave., Chicago. Ill. Stamping is gaged from the table top and contours of the revolving rolls are made to fit. Gage range of these machines is from No. 24 to No. 12, but they can be made in larger capacities if required.

Rolls are revolving at all times and they are opened by one roll being moved away from the other pneumatically, permitting the loading and unloading of the machine. The small roller or cutter, as the case may be, has horizontal adjustment and is actuated toward or away from the large roll by means of an air cylinder which is controlled by a foot valve. The large roller or cutter has vertical adjustment. Table is provided with vertical adjustment when required.



Dumore Model 38 Alloy Grinder

Powered by a ⅓ hp. universal motor, the Model 38 alloy grinder offered by The Dumore Co., Racine, Wis., develops 20,000 r.p.m. for grinding, polishing and "rubber



Guaranteed Precision

Guarantee

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

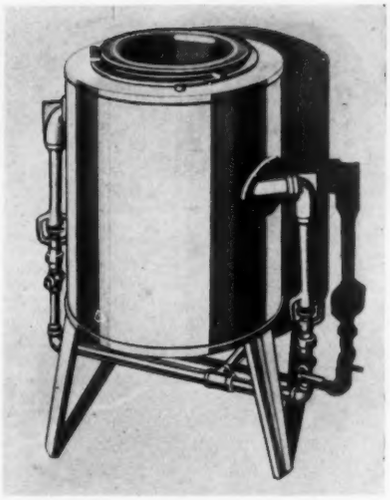
The Guaranteed Precision Limits of the Rivett 608 back-geared screw cutting lathe are achieved by perfection in design, the use of materials of highest obtainable quality and the finest of workmanship checked by accurate gauging and inspection devices. This guaranteed precision is retained for long periods of time by reason of proportionately great slide areas, vibrationless drive, and three point bed mounting.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

wheeling" chrome alloys and other stainless metals. Standard chuck for this unit is a $\frac{1}{32}$ in. collet-type, but a No. O Jacobs chuck and a $\frac{1}{8}$-in. collet chuck also are available. The unit is complete with a hand wheel for quick wheel changes, a safety glass eye shield and a work light.

Holden Small Gas Furnaces

Three sizes of a small gas furnace which require no auxiliary air have been announced by A. F. Holden Co., New Haven, Conn. Pot sizes in these furnaces measure 8 x 12, 10 x 14 and 12 x 16 in. These units can be controlled automatically and they are particularly applicable for use in small shops for case hardening and heat-treating tools. They can be used for temperatures from

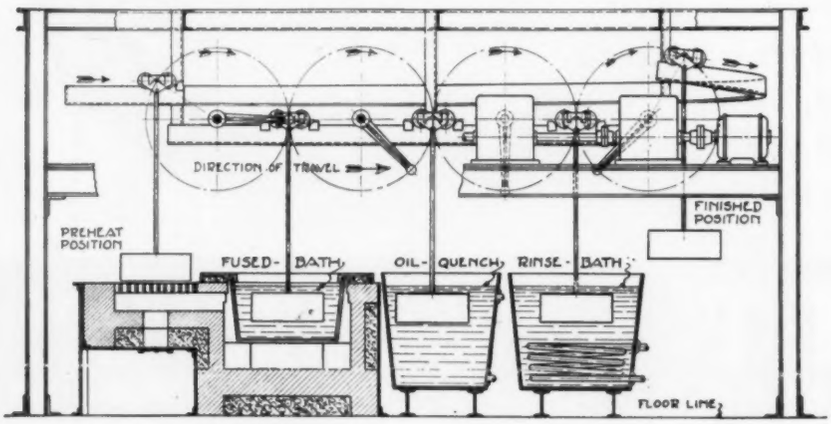


300 F. for tempering steel up to 1,650 F. for carburizing, or for any Holden heat-treating bath within this range of temperature.

Continental Automatic Heat Treating Unit

Arranged to mechanically take finished articles in large quantities and continuously, without further handling, pre-heat them, immerse them in a cyanide bath, quench, wash, rinse and return the finished articles to the operator, the automatic heat-treating unit shown has been developed by Continental Industrial Engineers, Inc., 201 North Wells St., Chicago, Ill., for treating shafts, gears, cams and special attachments used in automotive equipment. It is claimed that the mechanical features of operation insures that each piece will be treated in a manner identical with every other piece. An automatic air draw can be added to this equipment in those cases in which drawing is a part of the operation, the air draw involving no additional handling and, in the case of a low temperature draw, often may be accomplished by using waste heat.

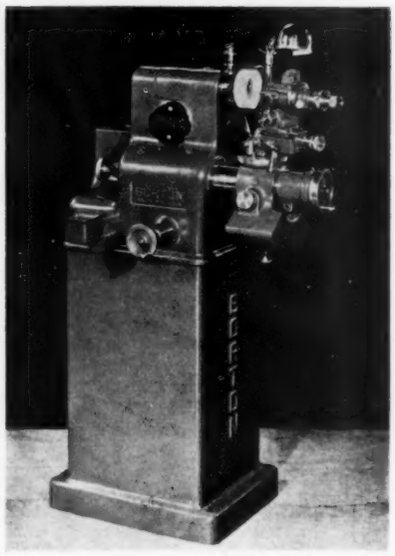
Use of a pre-heat furnace reduces the amount of power required and serves to eliminate or greatly reduce the thermal shock which ordinarily exists when cold steel particles are plunged into a cyanide bath. Since all handling and timing is maintained mechanically, any degree of case, within commercial limits, may be obtained. The operator is located well away from the heat and fumes and his sole duties are to load and unload the machine. He handles only cold, clean material in a well-ventilated spot.



Gorton No. 375-2 Cutter Grinder

George Gorton Machine Co., 1107 Thirteenth St., Racine, Wis., offers the No. 375-2 cutter grinder for grinding small cutters, not larger than $\frac{5}{8}$-in. shank, used in die and mold cutting and pantograph engraving and profiling operations. It has been designed particularly for grinding single-flute cutters, but two and four flute cutters and cutters with two, three, or four sides or flats can be ground.

Equipped with universal tool head No. 717-1, this grinder is suitable for grinding cutters to any desired diameter, taper, shape or clearance with a square, conical or ball nose. Micrometer dials are provided for all adjustments and an index dial and plunger is provided. Straight cup wheels are used for single-flute cutter granding and flaring cup wheels for multi-flute and spiral flute cutters.



Oilgear 300-Ton Hydraulic Press

Malleable iron castings are die straightened to the proper shape with close tolerances in this 300-ton two-column hydraulic speed press built by the Oilgear Co., 1319 W. Bruce St., Milwaukee, Wis. This high-speed press features rapid approach and return ram speed with sensitive control of the rapid traverse and pressing variable ram movement. Automatic unloading of the pump discharge is provided.

The main press structure consisting of the base, side frames, yoke and oil reservoir is uniformly welded into a compact piece weighing 17,500 lb. The rapid traverse cylinder is built into the main piston and ram with the piston rod fixed to the top of the main cylinder. Fluid power operation is provided by an Oilgear Type DHP-2025 two-way variable delivery pump, direct-connected to a 15-hp. motor.

In operation, depressing the hand

This New Bulletin
HAS FACTS YOU WANT

Keep up on the developments which enable you to weld easier, faster and with better results. This new bulletin is fully illustrated and filled with useful information about the newest practices in all types of welding.

ASK FOR YOUR FREE COPY

A COMPLETE MANUAL FOR WELDING OPERATORS FREE!

Here, in simple form, you'll find the answers to scores of welding problems. It's fully illustrated, interestingly written—packed with all sorts of helpful information. These are a few of its chapters:

1. How to Identify Metals by Spark Tests
2. Welding Procedures
3. Operating Instructions for Welded Joints
4. The Why and How of Stress Relief
5. Stress Formulas for Welded Joints
6. Metal Deposited in Welding
7. Speed of Manual Arc Welding, Welding Symbols, etc.

Ask, also, for your copy of Bulletin W-10, "The Arc Welding of Tomorrow." It describes the complete line of P&H-Hansen Arc Welders with simplified single current control and patented automatic volt-ampere regulation. Offered in all capacities from 75 to 600 amperes. Use the coupon.

Smootharc Welding Electrodes are first to be packed in moisture-proof cans — always "factory-fresh" whether you use them next week or next year.

HARNISCHFEGER CORPORATION
4514 W. National Ave., Milwaukee, Wis.

Please send bulletins as checked below:

- ☐ Bulletin R-5 "P&H Smootharc Welding Electrodes"
- ☐ Bulletin W-10 "The Arc Welding of Tomorrow"

We are interested in the welding of.....

.....(kind of work).....

Firm Name.....

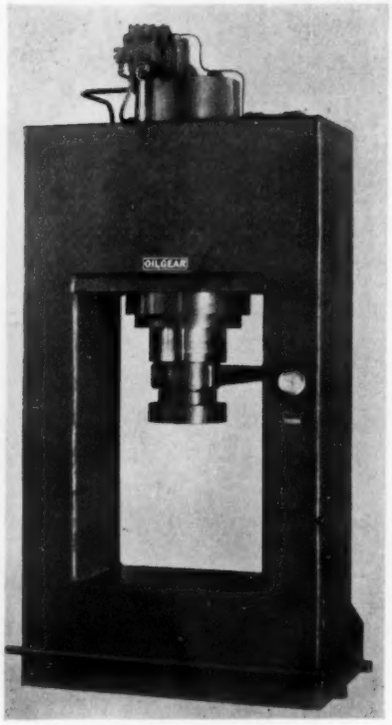
By.....(Title).....

Address.....

City.....State.....

HARNISCHFEGER CORPORATION

WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

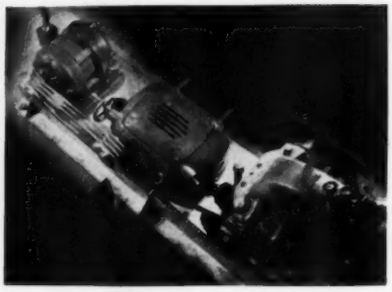


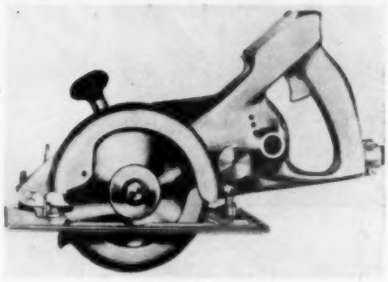
lever or foot treadle causes the ram to approach the work rapidly and then automatically slow down to pressing or full tonnage speed when the work is reached. Ram continues downward until maximum tonnage or positive stop is reached and will maintain full tonnage on the work until the operator releases the lever or treadle. Operator can inch, reverse or stop the ram at will. Specifications: capacity, 100–300 tons; stroke, 24 in.; daylight space, 42 in.; distance from floor to top of base, 24 in.; width between columns, 42 in.; size of base, front to back, 30 in.; over-all height, 148 in.; width, 74 in.; depth, 66 in.; net weight, 26,500 lb.; maximum rapid traverse speed down, 220 in. per min.; maximum rapid traverse speed up, 250 in.; maximum pressing speed down, 15 in. per min.

Texrope "Vari-Pitch" Speed Changer

A speed-changing unit using the principle of the "Vari-Pitch" sheave has been developed by the Texrope Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. This device consists of a pair of shafts on which are mounted two deep-grooved "Vari-Pitch" sheaves adjusted through a worm and worm wheel operated either manually by means of a handwheel or electrically through a pilot fractional hp. motor. This motor can be controlled through a forward and reverse pushbutton located within easy reach of the machine operator.

The changer can be operated at high speeds, permitting the use of a direct-connected motor. Double shaft extensions permit the unit to be driven from either side or either end. Seven sizes are offered, covering a range of from 1 to 33 hp., with a speed range of 3.75 to 1, and running between approximately 300 and 3,600 r.p.m.





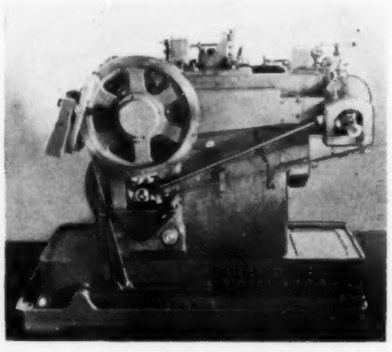
Van Dorn No. 35 Electric Trim Saw

Weighing 11¼ lb., the No. 35 trim saw offered by Van Dorn Electric Tool Co., Towson, Md., is suitable for use where 1⅜ in. is the maximum vertical cut required. This tool uses a 5-in. diameter saw blade and operates at 2,800 r.p.m. under full load. Over-all length is 14 in. When swiveled to a 45 deg. angle, this tool will cut to a depth of 1 in.

Waterbury "Hypro" Cold Header

Headed screw blanks can be made from $\frac{3}{16}$-in. diameter wire at the rate of 225 per min. with the "Hypro" cold header announced by the Waterbury Farrell Foundry & Machine Co., 425 Bank St., Waterbury, Conn. This is a solid-die, double-stroke crank machine in which two blows are delivered per revolution of the flywheel. Machines are arranged either for belt drive, as shown, or for individual motor drive by multiple V-belts. There are two standard sizes—the $\frac{3}{16}$-in. machine for work up to 1-in. long under the head, rated at 450 blows per min. and the ¼-in. size for 1½-in. maximum length which operates at 350 blows per min. and produces 175 blanks per min.

Roll feed is provided with an auxiliary mechanism which makes it impossible to manually engage the ratchet and pawl, except at the start of the forward feed movement. This is claimed to make it impossible to feed a shorter length of wire than that required. The device which cuts off the wire and transfers the blank into the heading position is adjustable for timing and for locating the knife relative to the dies. The heading unit, which includes the horizontally reciprocating gate and the vertically reciprocating punch slide, is designed for high-speed operation, as is the knockout-device which takes the heading thrust and ejects the headed work. The $\frac{3}{16}$-in. belt-driven machine occupies a floor space area 32 x 56 in. and weighs 3,300 lb.; the ¼-in. machine is 50 x 66 in. and weighs 6,600 lb.

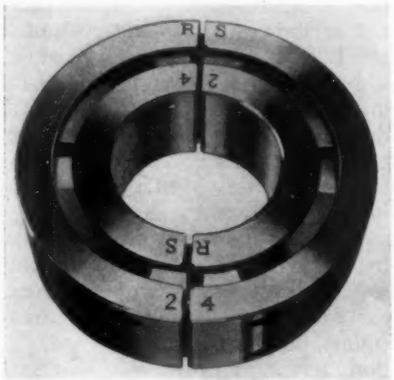


Split-Type Ball and Roller Bearings

Divisible-type ball, roller and thrust precision bearings are offered by Split Ballbearing Corp., Lebanon, N. H., in light, medium and heavy-duty ratings. These bearings are offered in a "Star" precision series and in a transmission series, for which split hangar boxes and single and double pillow blocks are available.

Standard fastening means used in the raceways is a tapered socket head screw. The tapered section automatically acts as a pilot, which insures against any attempt to bring the two halves together out of register. Raceway halves are not inter-

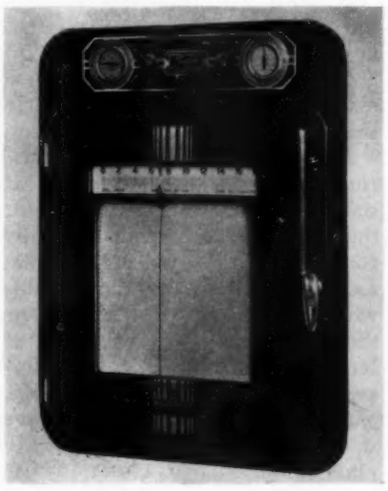
changeable and cannot be turned around with their unmatched ends facing each other. Identification stampings insure properly matching the split raceways.



Taylor Controller With Manual By-Pass

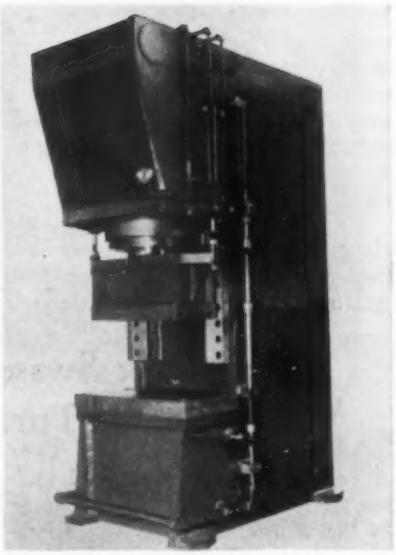
"Fulscope Micromax" controllers manufactured by Taylor Instrument Cos., Rochester, N.Y., now are available with a manual by-pass which permits starting the apparatus on hand-control and cutting in the automatic control as the operating temperature is reached. When hand operation is required, the manual by-pass enables the operator to change the controlling-medium input at the instrument where its effects are recorded. Adjustments or repairs to the instrument are possible without unduly disturbing the heat balance in the apparatus.

Change-over from manual to automatic control, or vice-versa, is simple. When the left adjusting knob on the instrument sub-panel is turned to the arrow marked "Automatic", a four-way air valve on the back of the panel connects the air supply to the "Fulscope" control mechanism. When the knob is turned to the arrow marked "Manual" the four-way valve connects the air supply directly to the diaphragm valve, or the "Dubl-Response" control unit as the case may be, bypassing the "Fulscope" mechanism.



Verson No. 200HD Hydraulic Press

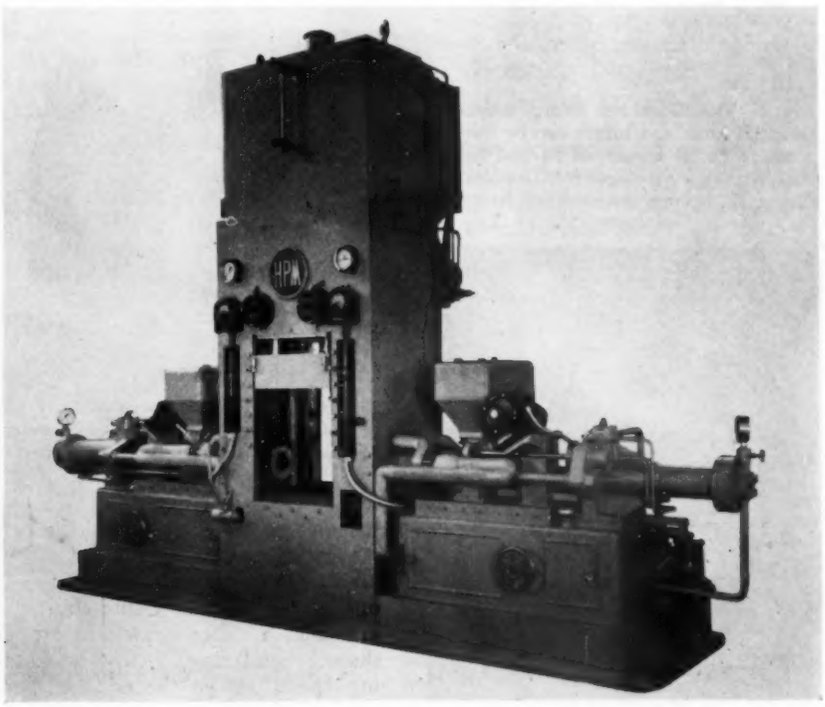
This 200-ton, gap-type hydraulic speed press offered by Verson All-steel Press Co., 9306 S. Kenwood Ave., Chicago, Ill., has a downward pressing speed of 37.6 in. per min., and a rapid traverse down of 464 in. per min. Rapid return of main ram is 660 in. per min. Control is through a foot lever; an emergency hand lever is provided. Hydraulic equipment and motor is inclosed in the machine. Slide operates in adjustable bronze-lined gibways and the ram does not come in contact with the cylinder walls at any time. Maximum working pressure is 300 lb. per sq. in. and stroke is 12 in. Main ram is 11½ in. in diameter.



H-P-M Model 100 "Hydro-Power" Injection Molding Press

Plasticizing capacity of the Model 100 "Hydro-Power" injection molding press announced by Hydraulic Press Mfg. Co., Mount Gilead, Ohio, is approximately 80 to 100 lb. per hr, and it is designed to operate at two complete cycles per minute. It has a clamping pressure of 100 tons and a maximum projected mold cavity capacity of 30 to 60 sq. in., depending on the shape and type of piece.

This machine consists of a vertical, downward-acting mold clamp mounted on a substantial base, together with two injection units one



on either side. Capacity of each unit is 8 oz., making a total of 16 oz. for the two units. These injection units are arranged to move toward the mold when it is clamped, so that the injection nozzles engage sockets on the parting line of the mold.

Power unit for operating the clamp is mounted overhead on the back of the frame and a surge tank on top holds the operating oil. Auxiliary reservoirs, connected with the surge tank, are provided under each injection unit. Separate power units for each injection unit are mounted on these auxiliary reservoirs just back of the injection cylinder supports. A hydraulic ejector is built into the base of the clamp. This is controlled manually by a small valve. Closing of the mold is assisted by gravity, making possible speed with economy.

Warner & Swasey Offers Improved Line of Turret Lathe Tools

A complete line of improved tools for turret lathes has been announced by the Warner & Swasey Co., Cleveland, Ohio. These tools are said to be more massive and to provide greater rigidity and increased holding power. Adjustable cutters and simplified clamping devices are provided so that set-ups can be changed easily and quickly.

An adjustable single turning head which has one whole adjustable in the vertical position, included in this line, can be changed from one job to another simply by moving the block up and down. A quick-acting slide tool, also offered, combines in one attachment the features of the standard slide tool and the standard boring and recessing tool. It is designed for fast recessing, the slide moving $\frac{1}{2}$ in. with a $\frac{1}{4}$ turn of the handle. For accurate work, adjustments for size are made by using the graduated dial provided on the stop screw.

Using a square cutter, the combination end facer and turner shown in Fig. 1, becomes a single cutter turner. With a flat cutter it can be used as an end facing tool. When used as a turning tool with the rolls either ahead or behind the cutter, it will turn short shafts, studs, bolts or short diameters on the ends of long bar work. Using the same tool with a cutter ground to proper shape, chamfering, facing or forming operations on the ends of bars can be performed. The cutter block can be removed and the tool used as a roller steady rest during cross slide operations. Also offered is an adjustable angle cutter holding with a wedge-type slide lock, a taper turner with roller back rest as shown in Fig. 2, an adjustable knee tool for short bar work, stub boring bar sleeves or eliminating excessive overhang on small diameter stub boring bars and stub boring bar cutter heads for combining chamfering and boring cuts in one operation.

The multiple cutter turned shown in Fig 3 can be set up to combine several diameters of turning cuts on bar work. One, two, three, or four cutters can be set in any combination, and multiple cut can be taken with heavy feeds. Roll brackets fastened to the cutter blocks are bracked against the back of the tool. Brackets and blocks can be adjusted endwise and the cutter blocks are reversible.

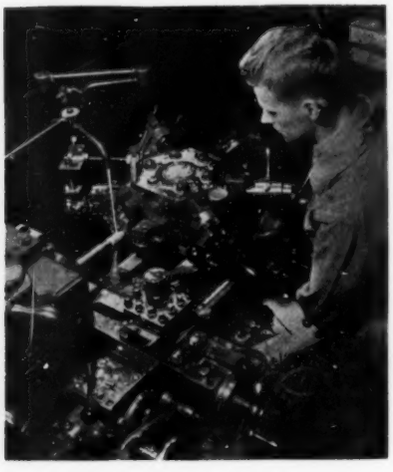


Fig. 1—The Warner & Swasey combination end facer and turner can be used as a single cutter turner, as an end facing tool, or can be used for chamfering, facing or boring the ends of bars and shafts

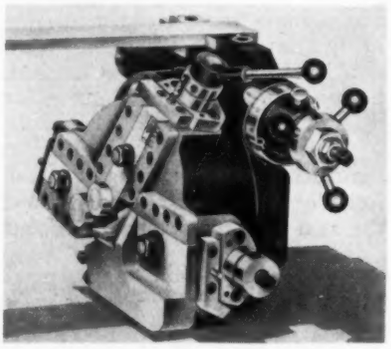


Fig. 2—This taper turner with roller back rest offered by Warner & Swasey is designed primarily for turning locomotive frame bolts. The supporting rolls follow the cutter and finished taper work is produced in one cut

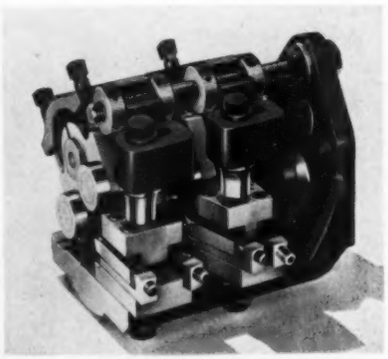
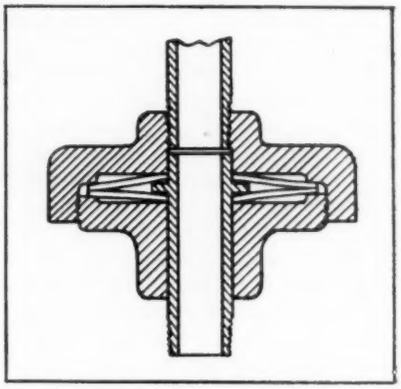


Fig. 3—The multiple cutter turner can be set up to combine several diameters of turning cuts on bar work. Such cuts can be taken with heavy feeds



Marsh Packless Unit For Rotating Shafts

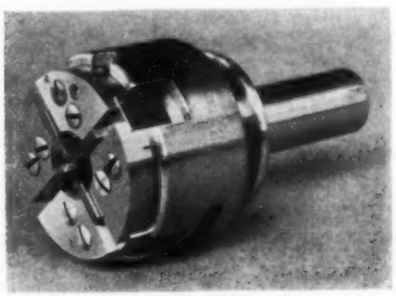
Developed for use in equipment where a shaft or pipe revolves or oscillates through the wall of a tank and a seal must be maintained, the packless unit shown is offered by James P. Marsh Corp., 2073 Southport Ave., Chicago, Ill. In its essentials, the unit consists of a shaft or tube on which is machined a collar. Pressing against the upper and lower faces of this collar are stainless steel spring wafers. Since the wafers are of spring steel, they form a close, uniform contact around the faces of the shoulder when compressed together around their outer edges, forming an effective pressure seal. The unit is available as a self-contained flanged assembly and in a number of other standard and special forms in a range of sizes.

Narragansett "Midget" Pump

The "Midget" centrifugal-type pump announced by Narragansett Products Corp., 45 Baker St., Providence, R. I., is adaptable to pumping coolant, circulating liquids and other uses. Unit is portable and is designed with top suction, which is claimed to assure long life.

H & G Size No. 00 Rotary Die Head

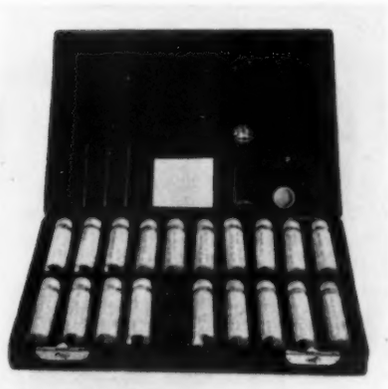
Designed primarily for use on Davenport automatic screw machines, the No. 00 Style MM insert chaser die head offered by The Eastern Machine Screw Corp., 20 Barclay St., New Haven, Conn., has capacity up to and including $\frac{3}{8}$ in.



diameter. It measures $2\frac{1}{8}$ in. in diameter by 2 5/32 in. over-all length, excluding shank. Weight is less than $1\frac{1}{2}$ lb. When ordered for use with a Davenport automatic, the die head is furnished with a hardened shank to fit the threading spindle of that machine.

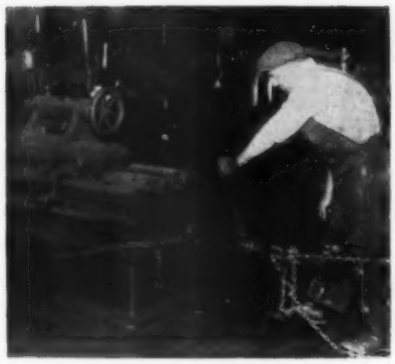
Van Keuren No. 20HS Measuring Wires

A complete set of high-speed steel measuring wires for pin measurement of gear teeth is offered by The Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass. Assortment No. 2OHS includes wires which touch at the pitch diameter for pitches of: 6, 7, 8, 9, 10, 11, $11\frac{1}{2}$, 12, 13, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 and 36-pitch. Use of high-speed steel for measuring wires is claimed to increase their life by a large percentage.



Morse Improved Inserted-Blade Cutter

Developed primarily for use with cemented-carbide tipped blades, an improved line of inserted-blade milling cutters is offered by Morse Tool Co., Inc., 16 E. Golden Gate Ave., Detroit, Mich. No wedges are used to lock the blade in the slot. The cutter-head proper is serrated on the bottom of the slot and blades are serrated to correspond with the slot serrations. Blades are held by two setscrews which drop into a slot on the top side of the blade and hold it securely against the serrations and against the thrust side of the head.



Coffing "Safety Pull" Ratchet Hoist

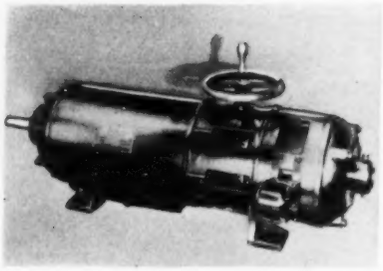
A pushbutton safety control is featured in the "Safety Pull" hoist announced by Coffing Hoist Co., Danville, Ill. When the load has been elevated and it is desired to lower the hoist, the operator simply pushes in the button and the hoist's action is reversed. This control also acts as a safety stop; if the worker's hand should slip off the handle while operating, this device automatically locks the handle before it can revolve or cause damage. These units are available for loads from $\frac{3}{4}$ to 15 tons and weigh from 14 to 150 lb.

Bonney No. 4098 Ratchet Wrench

No. 4098 reversible ratchet wrench offered by Bonney Forge & Tool Works, Allentown, Pa., is 15 in. long and is suitable for use with $\frac{1}{2}$ in. square-drive sockets, handles and attachments. It can be changed to a 10 in. ratchet for use in close quarters by removing the extension which screws into the handle of the 10 in. end.

S.-A. Type J.F.S. Motorized Reducers

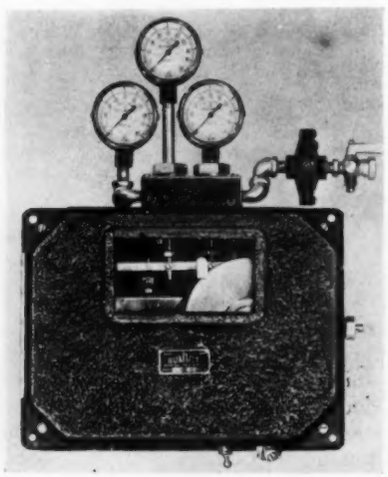
A line of compact, self-contained Type J.F.S. variable-speed drive units consisting of a variable reducer transmission and an electric motor is offered by Stephens-Adamson Mfg. Co., Aurora, Ill. These



units can be mounted on the floor, wall or ceiling and a conveniently located control wheel permits regulation of output speed without interrupting operation. Motor shaft is extended to act as the high speed shaft of the transmission unit, thus eliminating a coupling, guard and one bearing. Horsepower ratings at minimum and maximum speeds range from $\frac{1}{8}$ to $\frac{1}{4}$ hp. for the No. 18-RG-1445-12 unit up to $2\frac{1}{2}$ to 6 hp. for the No. 5010-RG-284-18 reducer. These units are furnished complete with motor for 110, 220 or 440 volts, 2 or 3 phase, 60 cycle applications.

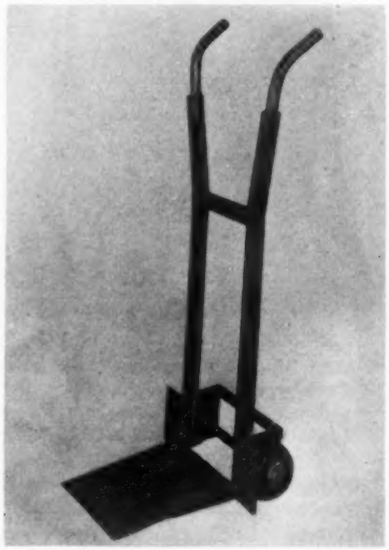
"Summit" Model CSC Cycle Controller

A choice of 27 different length cycles, made possible by the simple shifting of a gear shift lever, is provided in the "Summit" Model CSC time cycle controller offered by Industrial Instrument Co., 96 E. Miller Ave., Akron, Ohio. The time ratio of one operation to another can be varied by the rotation of a cam segment, or segments, in relation to the main cam. Standard controller is furnished complete with two air pilot valves, three pressure gages, an air strainer and shut-off valve, one "Micro" switch, a starter pushbutton and a synchronous motor for 110 volt, 60 cycle a.c. operation. Standard time ranges can be provided for cycles from $\frac{1}{2}$ to $2\frac{1}{2}$ min. in $\frac{1}{8}$ min. steps up to cycles ranging from 100 to 200 min. cycles by 10 min. steps.



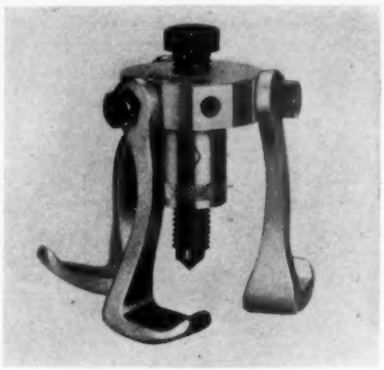
Barrett Scoop Truck

Designed so that the load is directly on the wheels and axle, this scoop truck offered by Barrett-Cravens Co., 3255 W. 30th St., Chicago, Ill., is of all-steel welded construction. Over-all width is $19\frac{1}{4}$ in. and height is 53 in. Wheels are 6 in. in diameter and are equipped with Hyatt roller bearings.



Reeves Vari-Speed "Motodrive"

"Motodrive" units announced by Reeves Pulley Co., Columbus, Ind., combine a driving motor, variable speed mechanism and reduction gears, where required, in a self-contained unit. It is built in five sizes, ranging in capacity from $\frac{1}{4}$ to 10 hp. Speed ratios range from 2 to 1 through 6 to 1. Horizontal and vertical designs are available. Fluid pressure control is available for all units.



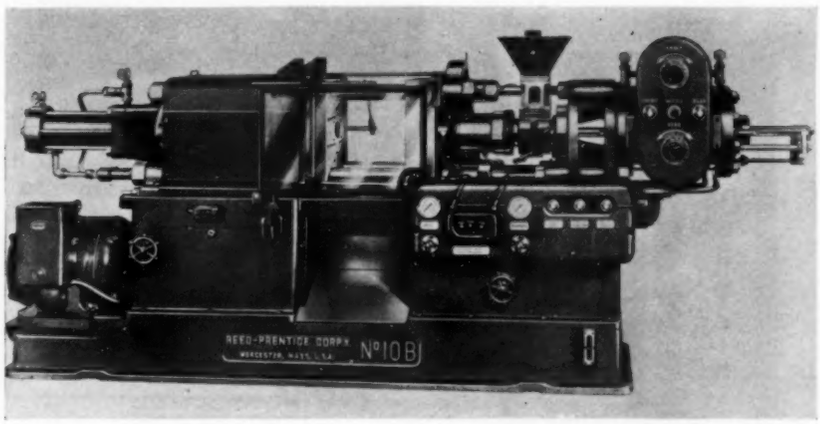
Imperial "Universal" Gear Puller

A compact and widely adaptable gear, pulley and flywheel puller is offered by the Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. Puller can be assembled either with two or three arms, as shown; clevises are provided to turn the arms at right angles to the positions shown for use in pulling solid gears.

It is claimed that this unit can be used for pulling spoked wheels regardless of size so long as the hub diameter is less than 3 in. and the wheel is within the depth reach of the puller. It can be used for pulling solid wheels and gears up to 7 in. in outside diameter. Depth of reach is $1\frac{1}{2}$ in.

Stanley Electric Screw Drivers

Two light-weight production electric screw drivers are offered by Stanley Electric Tool Div., The Stanley Works, New Britain, Conn. The No. O2H has an automatic pistol-type handle with a double pull trigger-type switch, while the No. O2 companion unit has an inclosed on-and-off switch mounted in the rear end bell. Both of these units are available in four driving speeds and are equipped with an adjustable tension clutch. Bits are available for driving Phillips screws.



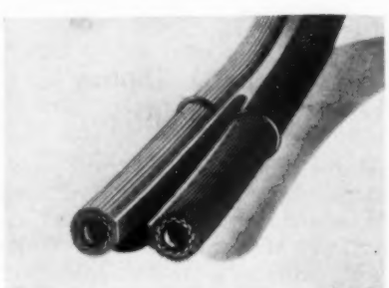
Reed-Prentice Model 10-B Hydraulic Plastic Injection Molding Machine

Having the same features as the No. 10 and No. 10-A machines previously described (*AM*—Vol. 81, page 304 and Vol. 81, page 996), the Model 10-B increased capacity plastic injection molding machine announced by Reed-Prentice Corp., Worcester, Mass., has capacity for 4 oz. on 24 sq. in. area at a maximum pressure of 16,000 lb. or 6 oz. with 40 sq. in. at a maximum pressure of 16,000 lb. Locking pressure of the toggle mechanism is 85 tons. Net weight of this model is 12,000 lb.

Cycle control timers and push-buttons are located for convenient operation. Independent control of heat to front and rear heating bands is incorporated in this machine. Equipment includes a Vickers hydraulic pump with valve control, automatic indicating control pyrometer in addition to the two heat control rheostats, and three material nozzles.

"Electric-Siameez" Duplex Welding Hose

Electric Hose & Rubber Co., Wilmington, Del., offers the "Electric-Siameez" hose for all welding and cutting operations using working pressures up to 200 lb. The cover of this hose is claimed to be thick and tough to withstand dragging over castings and concrete floors. It is available in $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ in. sizes. Ends can be separated at the factory for attachment to equipment.

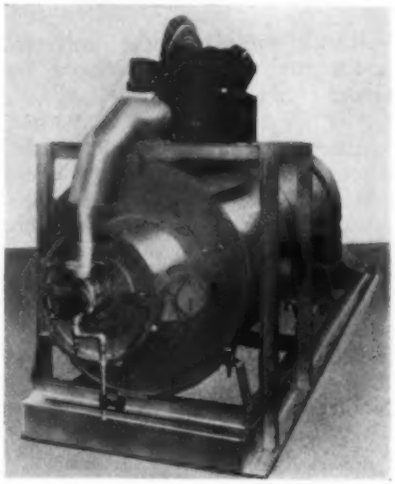


Ames No. 21 Pocket One-Inch Dial Scale

B. C. Ames Co., Waltham, Mass., offers the No. 21 pocket dial scale for measuring direct in 64ths, 32nds, 16ths, 8ths, and larger fractions of the inch. This scale has a full one inch measuring capacity. Case is polished and bright chromium plated. Moving the finger forward and backward against the operating wheel at the top causes the spindle and upper anvil to raise and lower the dial to turn. Measurement of parts placed between the anvils appears in the dial slot.

Despatch Oil-Fired Recirculating Heater

Employing convected air principles of heat transfer, this direct, oil-fired heater offered by Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn., is claimed to be adapted to all types of ovens and tempering furnaces. The unit is entirely self-contained and is simple to operate. No high-pressure factory air is required. All products of combustion enter the working chamber of the oven or furnace and varying amounts of recirculated or fresh air can be used without affecting the operation of the heater. These heaters are made in capacities ranging from 250,000 to 2,000,000 B.T.U. per unit.

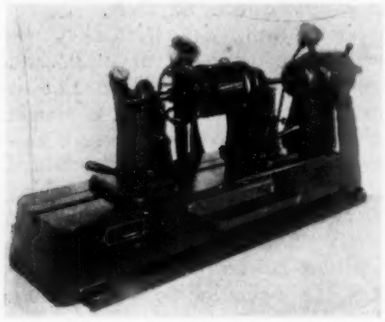


Globe Precision Dynamic Balancers

Available in nine sizes with clearance to swing from 9 to 120 in., the sensitive dynamic machines offered by the Globe Tool & Engineering Co., Dayton, Ohio have been improved to permit the selection of an open or closed type saddle. These saddles are readily interchangeable. In the open-type saddle, the shaft of the part to be balanced runs on the periphery of special ball bearings which are adjustable radially to fit different shaft diameters. In the closed-type saddle, the shaft of the part to be balanced is fitted to the saddle by making bushings to suit.

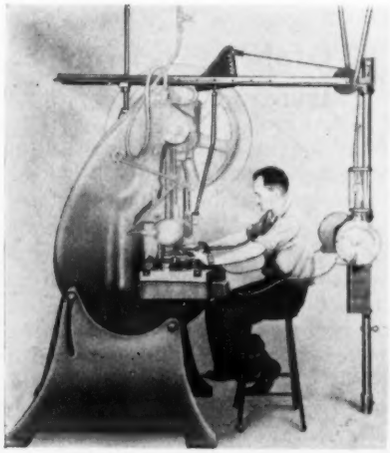
In these machines, all dials showing the state of unbalance are directly in front of the operator. Recording indicators show the magnitude of unbalance and readings are taken on these indicators at the time the location of the unbalance

is determined on the Neon light head. Weight range of the smallest unit is ¾ oz. to 5 lb., while that of the largest machine is 1,000 to 14,000 lb.



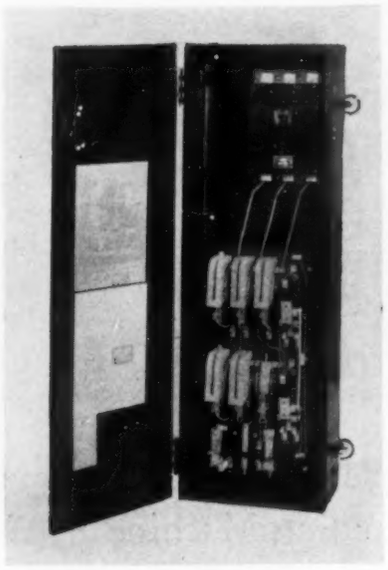
G.H. Universal Punch Press Guard

Pull-back cables of the universal punch press guard announced by Grand Haven Stamped Products Co., Grand Haven, Mich., are attached to the operator's wrists and, on the downstroke of the press, the operator's hands are pulled from the point of danger under the die. This guard is connected to the ram of the press and operates through the rocker arm assembly and cable, which is attached to the shaft. A positive action is obtained through the use of a rack and gear, teeth of the rack being cut in the shaft to which the cable is attached.



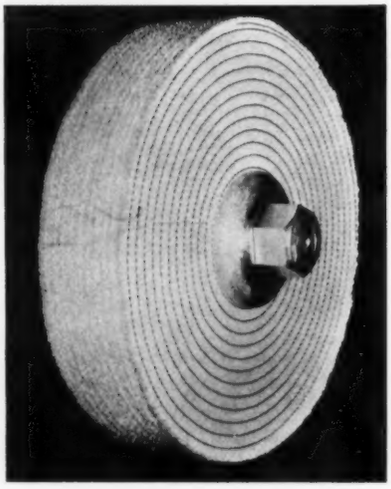
G. E. Magnetic Reversing Switches

A line of combination reversing switches which employ air circuit breakers has been announced by Industrial Dept., General Electric Co., Schenectady, N. Y. These switch units are intended primarily for full-voltage starting of a.c. motors. Complete device consists of an air circuit breaker, two magnetic contactors mechanically interlocked and a temperature overload relay, all inclosed in a sheet-metal case for wall mounting.



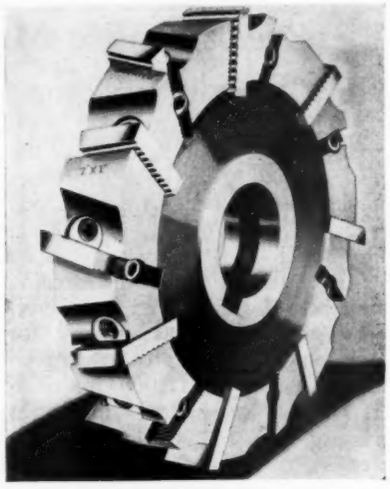
"Sisalin" Section Buffing Wheels

The Sisal used in Sisalin sections from which buffing wheels are assembled by Hanson-Van Winkle-Munning Co., Matawan, N. J., is prepared in mat form and is interleaved with alternate layers of muslin. The resultant product then is bound together by various types of sewing. External appearance of a Sisalin section is much the same as a cotton buff section. This product is used principally for intermediate operations between polishing and buffing. It is claimed to be especially effective in removing minor imperfections or die marks.



McCrosky "Jack-Lock" Inserted-Tooth Cutters

The addition of half-side mills and staggered-tooth side mills to the line of "Jack-Lock" inserted-serrated blade milling cutters has been announced by McCrosky Tool Corp., 1345-85 S. Main St., Meadville, Pa. Standard cutters in both styles are furnished in a range of diameters and widths suitable for a wide variety of work. Cutters with tungsten-carbide tipped blades can be furnished.

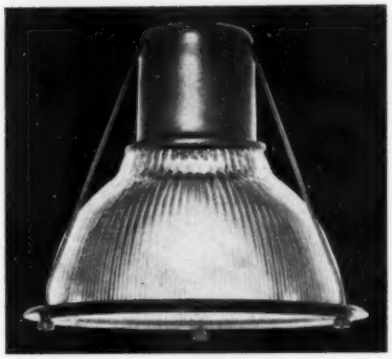


Williams Carbide-Turning-Tool Holder

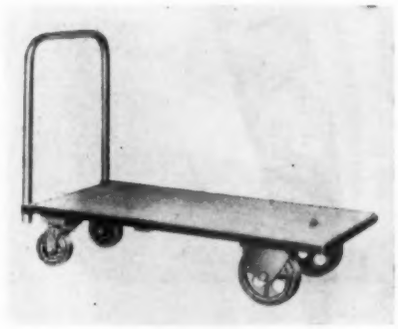
J. H. Williams & Co., 75 Spring St., New York, N. Y., offer carbide-turning-tool holders in straight-shank and in right- and left-hand offset patterns in five sizes. In these tools, the cutter is held parallel to the shank of the holder. Cutter bit can be ground so as to provide maximum support for the cutting edge.

Holophane "Lobay" No. 682 Reflector

Suitable for 300 and 500 watt lamps, the No. 682 "Lobay" reflector announced by Holophane Co., Inc., 342 Madison Ave., New York, N.Y., provides a 90 deg. spread of light. This unit completes a line of



reflectors in the 300-500 watt size which offer the choice of a concentrating, intensive or widespread light distribution from units similar in appearance. The prismatic reflectors, which determine the light distribution, are interchangeable in the same fixture part.



Clark "E-Z Roll" Platform Truck

Available in a wide range of standard sizes, and in special sizes to meet individual requirements, the Clark "E-Z Roll" platform truck, offered by All Steel Welded Truck Corp., Rockford, Ill., has an arc-welded steel frame and a hard maple deck. Standard platforms range in size from 24 x 48 in. to 36 x 60 in.

Cincinnati Slide Indicator Mounting

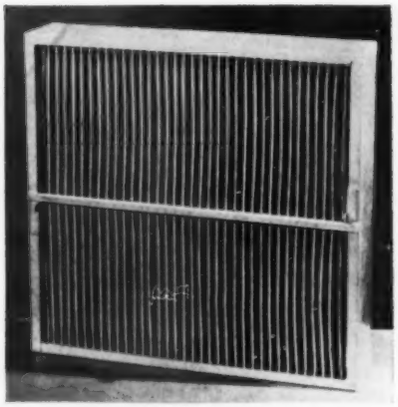
Consisting of a bracket which bolts to the upper slide, a steel rod carrying a contact dog, a supporting bracket which bolts to the machine bed and a 0.0001 in. dial indicator gage having a 3-in. face, this indicator attachment for use on No. 2 and 3 centerless grinding machines has been made available by Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio. Attachment is said to provide a quick and visible method of adjusting the regulating wheel slide to compensate for wheel wear. Indicator gage is located in a convenient position and is protected against injury by a stop lug, which limits the movement of the indicator finger, after contact, to a distance of 0.20 in.

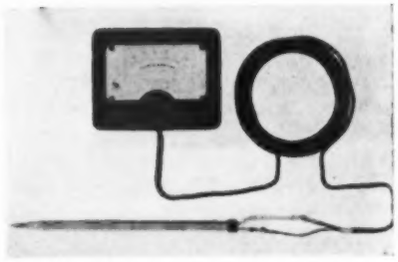
Oliver No. 232-D Tilting Saw Bench

Saw of the No. 232-D motor-on-arbor saw bench tilts while the table remains horizontal. This machine, offered by Oliver Machinery Co., Grand Rapids, Mich., is claimed to be suitable for ripping, cross-cutting, mitering, dadoing, gaining and similar wood-work within its capacity. A 12-in. diameter saw projects through the table $2\frac{3}{8}$ in. and saws up to 13 in. diameter can be used. Table is 34 in. high from the floor and measures 34 in. long by $33\frac{3}{4}$ in. wide. The 2 hp., 3,600 r.p.m. motor tilts to 45 deg. by means of a handwheel and screw.

Staynew "Wire-Klad" Dry-Type Air Filter

Fin construction of the "Wire-Klad" dry-type air filter announced by Staynew Filter Corp., 25 Leighton Ave., Rochester, N. Y., is said to afford a large filtering area in a relatively small space. The wire mesh reinforcement of the fins is sufficiently strong that the filter can be cleaned by high-pressure air or vacuum. Several kinds of filtering media are available to suit varying conditions. The most usual are cotton or a wool felt-like material known as "Feltex".





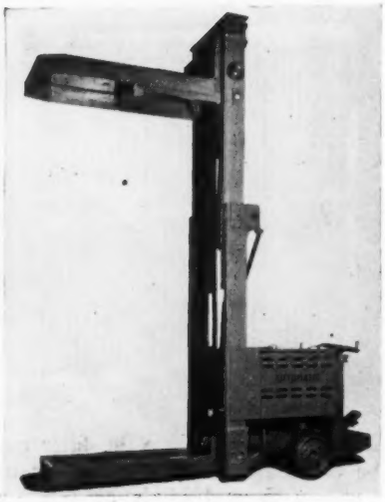
Lewis Complete Pyrometer Unit

Complete pyrometer units with accessories for industrial installation have been offered by The Lewis Engineering Co., Naugutuck, Conn. These installations include a vibration-proof pyrometer, thermocouple, lead wire, and a protecting well. The pyrometer is supplied in four scale ranges of 50-600 to 50-1800 F. Thermocouple is of iron Constantan and is 24 in. long.

"Automatic" 5-Ton High-Lift Truck

Developed for an application which required that skids should be stacked to a height of 14 ft., this 5-ton capacity telescopic high-lift platform truck built by Automatic Transportation Co., 101 W. 87th St., Chicago, Ill., has a lift of 91 in. when the uprights are collapsed to 119 in. Platform dimensions are 36 in. wide, 72 in. long and 11 in. high in the low position for skid entry. Lifting range and platform dimensions can be modified within reasonable limits.

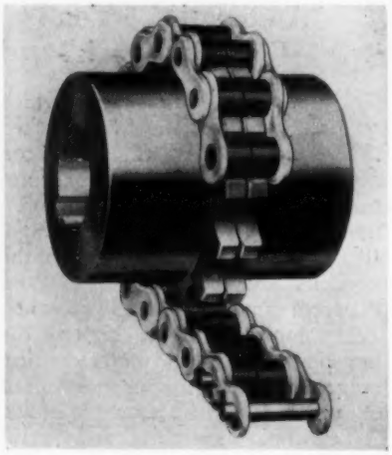
Telescopic uprights and main



fixed uprights are wide-faced steel bars, machined in channel form and heat treated. The hoisting mechanism comprises a triple spur-gear reduction transmission unit powered by a heavy-duty motor. Safety limit switches are provided for maximum travel range of platform up and down. Drive unit is a combination bevel and spur gear transmission with full-floating drive shafts and universal joints.

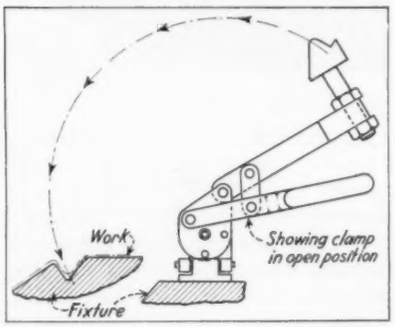
Link-Belt Type RCB Flexible Coupling

Type RCB flexible couplings, offered by Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill., consist of two cut-tooth sprocket wheels, or coupling halves, which are connected by a piece of steel roller chain. The divided roller, single-width chain is claimed to provide independent roller action for each sprocket. These couplings embody major improvements over the Type RC roller-chain coupling previously furnished.



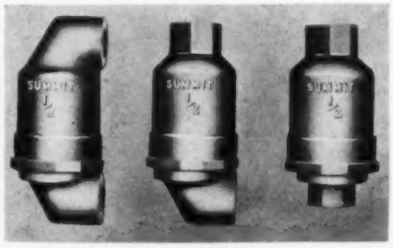
"Knu-Vise" Universal Toggle Clamps

Universal-action toggle clamps, available in three sizes, are offered by Knu-Vise Products Co., 6430 Cass Ave., Detroit, Mich. These clamps are claimed to provide a convenient method of locating and holding work pieces in fixtures of various types and are particularly applicable for sheet metal forming and welding operations. Toggle unit can be swung through an arc of 180 deg.; all pivot points rotating in hardened steel bushings.



"Summit" Swing Joints

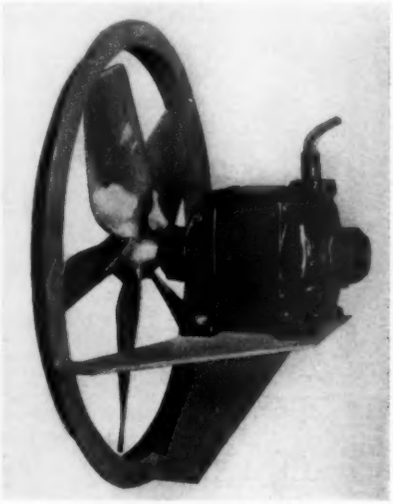
Type SJU, SJL, and SJS swing joints, shown left to right, offered by Industrial Instrument Co., 96 E. Miller Ave., Akron, Ohio, are claimed to be suitable for severe service conditions. These joints have five packing rings and a large swivel bearing. Each of the three types is available in ½, ¾, 1 and 1¼ in. sizes. They are pressure tight for oil, gas, air, water or steam service.



Armstrong Detachable Hollow-Screw Wrenches

Detachable-head wrenches now are offered for hollow-head screws by Armstrong Bros. Tool Co., 317-357 N. Francisco Ave., Chicago, Ill. Set No. AL-100 shown provides detachable head wrenches with T-handles, extensions and ratchets for all hex-socket hollow screws from ¼ to 1 in. in diameter. These tools are

made from chrome-vanadium steel, heat-treated and tested for maximum strength. They are marked for size and are chrome-plated.

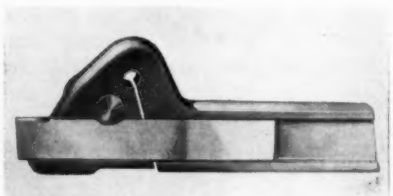


Binks W-F-D Exhaust Fans

Furnished with a guard over the five-bladed propeller, W-F-D exhaust fans offered by the Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., can easily be placed in a window, transom or other opening by mounting it in a wood or metal frame. Explosion-proof motors can be provided.

Williams Spring Tool Holders

Cut-off tool holders embodying a spring principle have been developed by J. H. Williams & Co., 75



Spring St., New York, N. Y. Due to the goose-neck design of this holder the cutter blade is said to be relieved of excess pressure. Holder, like the older rigid type of cut-off tool holder, features a positive cam cutter lock. These units are available both in straight and right-hand offset patterns in four sizes.

K. & E. Series 60 Blueprint Paper

Keuffel & Esser Co., Adams & Third Sts., Hoboken, N. J., announces the development of "Series 60" blueprint paper, which is claimed to have a deep blue color and a wide printing range. Tracings of varying transparency can be printed successfully at a single setting of the machine, or strong blueprints can be made from any tracing within a broad range of machine speeds. These papers are printed and washed with the same procedure as other blueprint papers. They are offered in three speeds and in 50 yd. rolls ranging in width from 24 to 54 in.

White "Protex" Temporary Coating

Highly finished surfaces can be protected throughout manufacture, storage and shipment with "Protex" temporary coating offered by Haydn F. White & Co., 1740 E. 12th St., Cleveland, Ohio. This material forms a thin, elastic film which is claimed to safeguard against dust, dirt, chemical attack, mechanical injury and adverse atmospheric conditions. It is applied by brushing, spraying or dipping. Tackiness must be neutralized either by dusting with powder or covering with paper. To remove, the film is broken and peeled off.

Cunningham Safety Steel Stamps

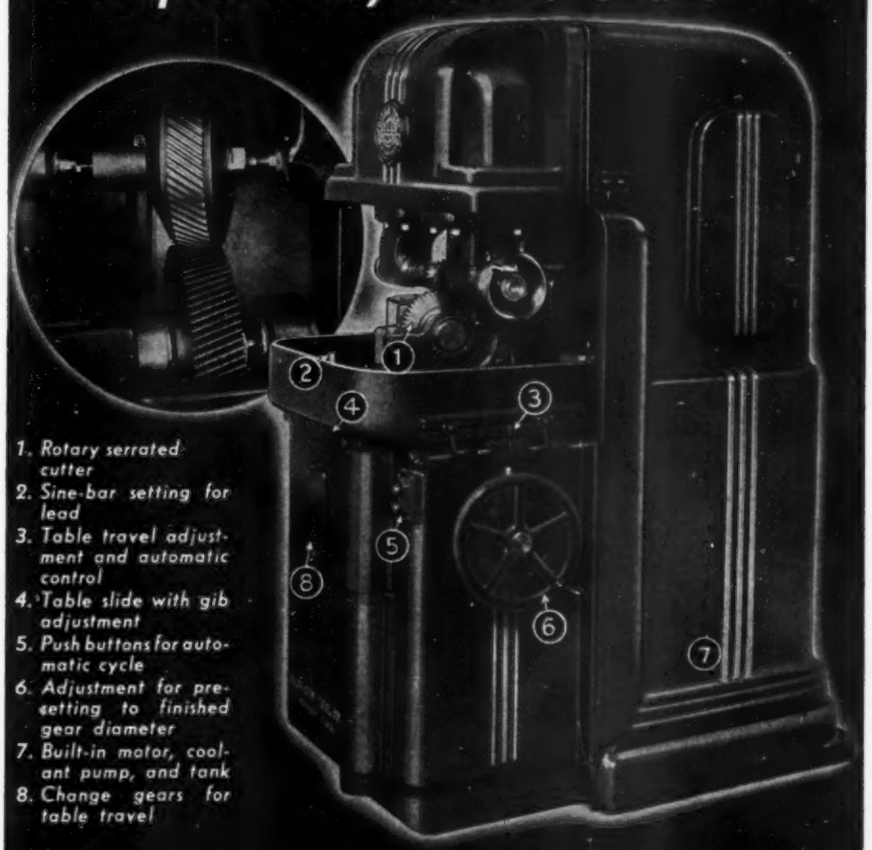
A safety steel stamp which can be inserted in a pneumatic hammer for marking rough castings prior to finishing is offered by the M. E. Cunningham Co., 160 E. Carson St., Pittsburgh, Pa. This stamp is claimed to withstand severe shock without mushrooming or spalling. Use of a pneumatic hammer enables the operator to drive a character deep enough into the casting so that it will not be obliterated during the process of finishing. Single character stamps are interchangeable quickly so that serial numbering can be performed if desired.

The average chipping hammer will take up to $\frac{1}{2}$ to $\frac{5}{8}$ in. characters, while the larger hammers used in many plants will take 1 to $1\frac{1}{2}$ in. characters. It is possible to obtain a die with a trade-mark design, as well as straight letters or figures. Once the stamp has been started into the object to be marked, the operator can drive the stamp as far as the background of the character.

Fansteel "Tantaloy" Available In Bar Form

It has been found that the making of thin-tip tools is readily accomplished by applying hard "Tantaloy" metal offered by Fansteel Metallurgical Corp., North Chicago, Ill., in bar form with an acetylene torch,

THE NEW "860"
for job lots, too . . . . . .



1. Rotary serrated cutter
2. Sine-bar setting for lead
3. Table travel adjustment and automatic control
4. Table slide with gib adjustment
5. Push buttons for automatic cycle
6. Adjustment for presetting to finished gear diameter
7. Built-in motor, coolant pump, and tank
8. Change gears for table travel

Just because your gear production quantities may be too small to take advantage of the maximum economies of the MICHIGAN Rack Type finisher is no reason—NOW—why you cannot finish your gears by crossed-axis shaving. The new Michigan "860" is low in initial cost and low in tool costs.

Its flexibility makes it ideal for job lots, yet it is the most rigid machine of its type on the market. Its action distributes wear evenly over the cutter—increasing cutter life and insuring maintenance of accuracy. More gears are finished today on MICHIGANS than on all other makes combined.

SEND FOR BULLETIN 101-61

MICHIGAN TOOL COMPANY, 7171 E. McNichols Rd. DETROIT, MICH.

MICHIGAN TOOL COMPANY, 7171 E. McNichols Rd., Detroit, Mich.
Please send further information regarding the new '860' and your bulletin No. 101-61.

NAME .....

ADDRESS .....

rather than by the conventional method of brazing. In making flowed-on tools by this method, the shank is recessed by milling or grinding. Ordinary carbon steel may be used for the shank, or Tantaloy may be applied to high-speed steel tools which have worn undersize. After the Tantaloy is sweated on, the tool is ground and is ready for service; no hardening or tempering is necessary. This metal now is available in bars ¼-in. in diameter and 9 in. long coated with flux.

Textite "Hager" Cleaning Separator

The "Hager" separator for cleaning compressed air, gas and steam, offered by Textile Corp., 2110 Roscoe St., Chicago, Ill., is claimed to eliminate all possibility of pollution and to remove all water, oil and dirt at the point of use. The entire cleaning unit measures only 10½ in. high by 6 in. in diameter and weighs 15½ lb. Cleaning separation is obtained by linear deflection, jetting, centrifugal force, capillary attraction and sudden expansion. Mounted one above the other in this separator are three internal vaned units through which the air, gas or steam must travel in succession before it can issue at the top connection.

New 48-page illustrated booklet entitled "The Story of Sulphurized Cutting Oils" now available to personnel of metal working plants. Please write to 2727 South Troy Street, Chicago, for your free copy using company letterhead and stating capacity.

TRADE PUBLICATIONS

ARC WELDER Bulletin No. 327 offered by Lincoln Electric Co., Cleveland, Ohio, discusses the features of Type S-6037 Diesel-engine driven "Shield-Arc SAE" Welder.

BALANCING Type EO vibro-electric static and dynamic balancing machines are discussed in detail in Bulletin No. 14 offered by Tinius Olsen Testing Machine Co., 500 North 12th St., Philadelphia, Pa. This 24-page booklet illustrates a number of typical uses of these machines and describes the operation of the various units.

BEARING MOUNTINGS Bulletin B-50, offered by R-S Products Corp., Germantown Ave., Philadelphia, Pa., discusses standard appliances for anti-friction bearing mountings.

CERAMIC MATERIALS A chart of properties of ceramic insulating materials, corrected to March 1, 1938, has been published by American Lava Corp., Chattanooga, Tenn.

CHUCKING GRINDER Type "C" 3-in. hydraulic chucking grinder is described in detail in a 12-page bulletin, No. L-38, published by Landis Tool Co., Waynesboro, Pa.

CONTROL STATIONS Heavy-duty type pushbutton control stations, Class No. 9001, are described and prices are given on a supplement price sheet No. 40–101–S now being distributed by Industrial Controller Div., Square D Co., 710 S. Third St., Milwaukee, Wis.

DEW-POINT Bulletin No. GEA-2630 offered by General Electric Co., Schenectady, N. Y., describes a dew-point potentiometer for determining the moisture content of gases.

DIAL SCALE Dial Scale No. 21, a pocket gage that measures directly in fractions of an inch, is described on a mailing folder offered by B. C. Ames Co., Waltham, Mass.

DUST CONTROL A mailing folder now being distributed by Pangborn

Corp., Hagerstown, Md., discusses the advantages of cloth-filter dust collectors.

ELEVATOR The "Electricwaiter," a heavy-duty unit designed to fill the gap between the dumbwaiter and the elevator, is described in a four-page bulletin, No. 525, published by John W. Kiesling & Son, Inc., Brooklyn, N. Y.

EYE PROTECTION Eye protection eqipment of various types is described and illustrated in an eight-page bulletin, No. CE-4, offered by Mine Safety Appliances Co., Pittsburgh, Pa.

FINISHING Bulletins No. 15-S and No. 23-L, now being distributed by Hilo Varnish Corp., 42-60 Stewart Ave., Brooklyn, N. Y., discuss the features of "Fine Gloss Ripls" crackle finishes having a metallic sparkle and "Trans-lux" metallic colored lacquers. Application recommendations are given.

FIXTURES A catalog showing in detail knuckle-action holding fixtures, universal toggle clamps and layout tables is being distributed by Knu-Vise Products Co., Inc., 6432 Cass Ave., Detroit, Mich.

FLEXIBLE SHAFTS Engineering Bulletin No. 38, offered by The S. S. White Dental Mfg. Co., 10 E. 40th St., New York, N. Y., discusses the use of flexible shafts for remote control. Copies should be requested on company letterhead.

FURNACES Leaflet No. 26-TB, published by Harold E. Trent Co., 618 N. 54th St., Philadelphia, Pa., discusses various types of electric furnaces using "folded and formed" heating elements.

GEAR-MOTORS A number of low-speed drives that have been modernized at a saving with gear-motors are illustrated in an eight-page bulletin, Form No. GEA-1929A, being distributed by General Electric Co., Schenectady, N. Y.

Trade Publications

HAND MOTIONS Studies in Engineering Bulletin No. 12 entitled "Studies of Hand Motions and Rhythm Appearing in Factory Work" has been published by the University of Iowa, Iowa City, Iowa. This bulletin has been prepared by Ralph M. Barnes, professor of industrial engineering, and Marvin E. Mundel, research assistant in mechanical engineering.

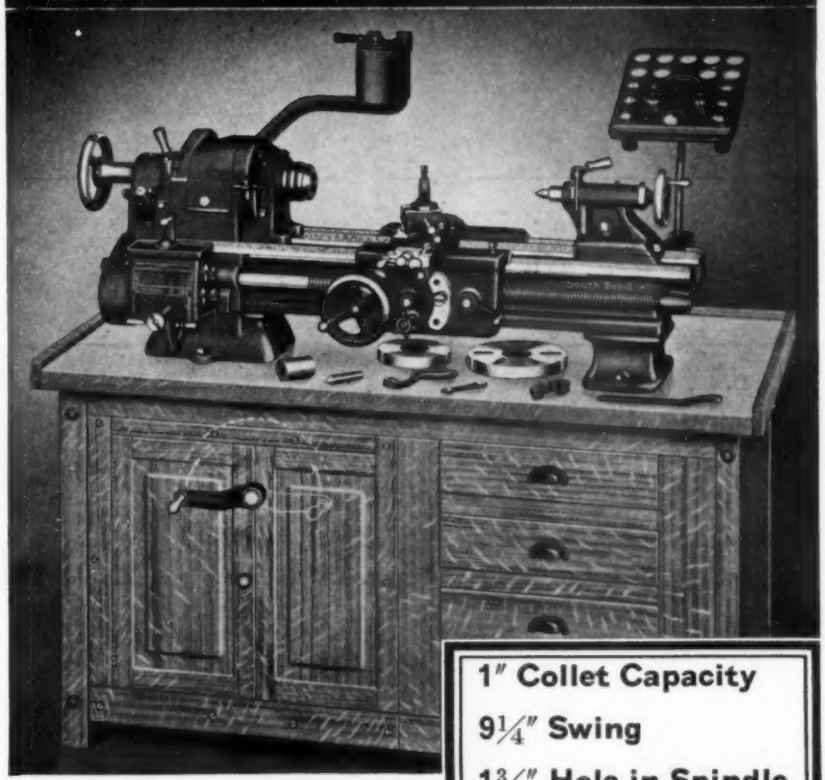
HOSE CARE A 9x12 in. instruction card outlining the proper care of rubber hose is being distributed by the Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J.

INSTRUMENTS "When You Can Measure", a 32-page bulletin recently published by General Electric Co., Schenectady, N. Y., describes how instruments are designed, constructed and tested. Ask for Bulletin No. GED-638.

LATHES "The Monarch Flame Hardened Lathe Bed" is the title of a four-page Bulletin, No. S-35, now being distributed by The Monarch Machine Tool Co., Sidney, Ohio. Lathes having flame-hardened beds now are available in all sizes and types up to 13 ft. 6 in. length.

LIGHTING HANDBOOK A completely revised lighting handbook entitled "Artificial Light and Its Applications" has been announced by Westinghouse Lamp Div. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This 258-page handbook contains 19 chapters and stresses the important part artificial lighting plays in eyesight conservation. Price, 75 cents.

New South Bend 1" Collet Lathe



1" Collet Capacity
9¼" Swing
1⅜" Hole in Spindle
Priced $387 and up

9¼" Swing by 3' Quick Change Gear, Underneath Belt Motor Drive Bench Lathe complete as shown above, with Draw-in Collet Chuck, 8 Collets, Collet Tray, ⅓ H.P. Motor, and Electrical Equipment, less bench. Wt. 680 lbs. f.o.b. factory..... **$656.50**

THIS new 9-inch lathe is a back-geared Screw-Cutting lathe with all engine lathe features, and is recommended for the manufacturing plant and the tool room. Draw-in Collet attachment available in Hand Wheel Type and Quick Acting Lever type. Six tool bed turret and Double Tool slide adapt lathe to multiple operation manufacturing jobs. Telescopic Screw Type Taper Attachment and other attachments also available.

SOUTH BEND LATHE WORKS
278 East Madison Street, South Bend, Ind., U. S. A.

Write FOR NEW CATALOG

Catalog No. 97 illustrates, describes, and prices the new 9-inch South Bend Large Spindle Hole Lathe in Underneath Belt Motor Drive, Pedestal Adjustable Motor Drive, and Countershaft Drive Types, and in 3', 3½', 4', and 4½' bed lengths. Copy sent free, postpaid.

SOUTH BEND *Precision* LATHES

MAGNETIC SWITCH An a.c. magnetic switch, Style CR7006–D40, for full-voltage starting of induction motors, is described on Catalog Page No. GEA-841H offered by General Electric Co., Schenectady, N. Y.

MASTER SWITCHES Style CR-3012 cam-operated master switches for use on a.c. or d.c. control circuits are described on Catalog Sheet No. GEA-1283A being distributed by General Electric Co., Schenectady, N. Y.

MILLING CUTTERS Simplified Practice Recommendation No. R36–34 on milling cutters, prepared by the Division of Simplified Practice of the National Bureau of Standards, has been reaffirmed by the Standing Committee in charge of the regular review of the program. Printed copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for five cents each.

MONEL GASKETS Features of Monel gaskets, pump parts and valve trim are discussed in an eight-page bulletin offered by the International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NITRIGAGES Features of nitrogen-hardened gages are discussed in a four-page bulletin offered by Sheffield Gage Corp., Dayton, Ohio.

OIL PURIFYING Oil and "inerteen" drying and purifying equipment is discussed in a 12-page booklet offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. In this booklet, Catalog Section No. 44-400, are described filter presses, combination filter press and centrifuges and separate centrifuges for oil, as well as reconditioners for inerteen and similar non-inflammable fluids.

PAINTING EQUIPMENT Catalog ID, a 28-page bulletin announced by The DeVilbiss Co., Toledo, Ohio, covers, in condensed form, spray-finishing equipment for industrial use. Full specifications on all standard items are given.

PLATING SOLUTIONS Publication of the fourth edition of "Simple Methods of Analyzing Plating Solutions" has been announced by Hanson-Van Winkle-Munning Co., Matawan, N. J. This booklet describes methods, in commercial practice, of analyzing electroplating solutions of all important metals.

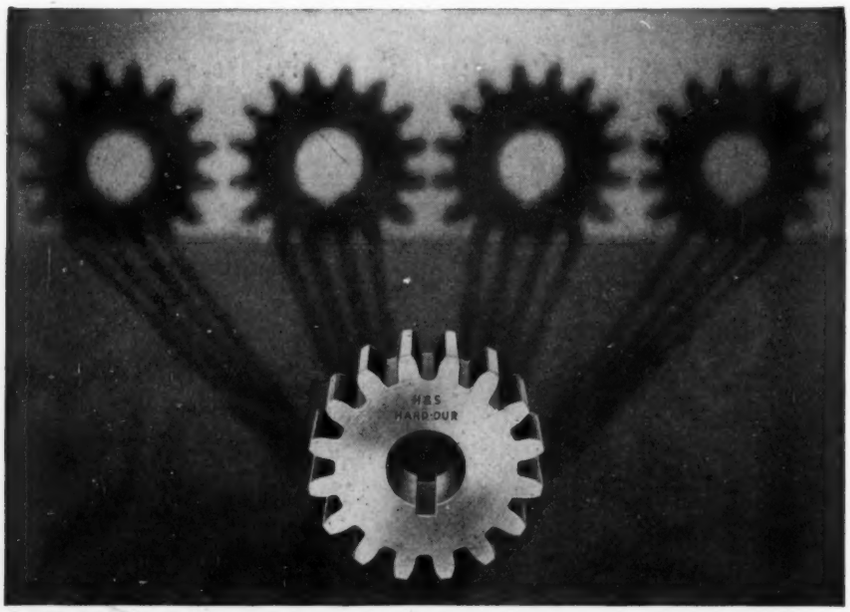
POWER FACTOR "We Raised our Power Factor and Save $900 a Year" is the title of a 24-page bulletin offered by The Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio. This booklet, No. 158, is a reprint of an article by Harry Wilcox which originally appeared in Factory Management and Maintenance.

PUMPS Bulletin No. 7067 offered by the Ingersoll-Rand Co., 11 Broadway, New York, N.Y., gives specifications and operating characteristics of Cameron Class GT two-stage centrifugal pumps.

PYROMETERS Wall and portable type indicating pyrometers are described on Leaflet No. A-382-S, offered by Thwing-Albert Instrument Co., 3339-41 Lancaster Ave., Philadelphia, Pa.

RIVETING Noiseless rotary rivet spinning machines of a number of sizes and capacities are described in a four-page bulletin published by Linley Bros. Co., Bridgeport, Conn.

SCREW DRIVER A power screw driver designed for bench mounting is described in a four-page folder being distributed by E. V. Haffling



4 TIMES THE LIFE

at only 50 per cent extra . . .

"HARD-DUR" Gears preserve the tooth form. They are made only of the finest gear steels and are scientifically heat treated to obtain the maximum physical properties. They are so much stronger, harder and more wear-resistant than similar untreated gears that they are guaranteed to have four to five times the life at only 50 per cent extra in cost. "HARD-DUR" Gears handle the tough jobs on which ordinary gears fail and when used on the average job they last almost indefinitely. A trial will prove their superiority and economy.

A valuable 448 page Gear book will be sent on request.

THE HORSBURGH & SCOTT CO.

GEARS AND SPEED REDUCERS

HAMILTON AVENUE, CLEVELAND, OHIO, U. S. A.

Co., 50 Remer St., Bridgeport, Conn.

SHIMS "Laminum" shims that are peeled for adjustment are discussed in a four-page bulletin offered by Laminated Shim Co., 21–42 44th Ave., Long Island City, N. Y.

SIX METALS A 16-page booklet entitled "Six Minutes with Six Metals" is offered by the International Nickel Co., Inc., 67 Wall St., New York, N. Y. Characteristics and uses of special alloys such as Iconel "K", "S", and "R" Monel, as well as the more generally known Monel and nickel are discussed.

SOCKET INSTRUMENTS Catalog Section No. 43–600, a 20-page bulletin offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes Type E socket instruments for outdoor and indoor industrial use.

SPEED CHANGER "Vari-Pitch" speed changers, recently announced by the Texrope Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis., are described in a 10-page bulletin, No. 1266, now available.

SPRINGS "Spring Principles and Design" is the title of a 32-page bulletin giving spring information for quick reference by purchasing agents, draftsmen and design engineers, offered by Raymond Mfg. Co., Corry, Pa.

SQUARING SHEARS An eight-page bulletin offered by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y., illustrates and describes Series KL power squaring shears.

STEEL VALVES Bulletin No. 5–7000 offered by Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn., describes a redesigned line of forged and cast-steel valves.

STOCK LIST A pocket-size booklet, giving listings and descriptions of a wide range of "Certified" steels and allied products has been announced by Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago, Ill. Reference tables, weight charts and standard specifications listings are included.

THREADING The model B portable pipe and bolt-cutting and threading machine is described in detail in an 8-page bulletin published by Beaver Pipe Tools, Inc., Warren, Ohio. Also, four-page bulletin, Form No. 438, giving net resale prices of a number of pipe cutting and threading tools is available.

TOOLS "Turret Lathe Tools" is the title of a 180-page, loose-leaf, wire-bound catalog offered by the Warner & Swasey Co., Cleveland, Ohio. Profusely illustrated with photographs and line drawings, this catalog discusses the features of each of the standard tools available for turret lathe use. Semi-standard and special tools also are described.

TUBING AND BARS A 16-page bulletin entitled "SKF Chrome Steel Tubing and Bars" has recently been published by SKF Steels, Inc., 369 Lexington Ave., New York, N. Y. This bulletin lists well over 200 sizes of seamless chrome tool steel tubing as well as some 60 sizes of solid chrome steel bars.

TUNGSTEN A 20-page bulletin offered by American Tungsten Association, 111 Sutter St., San Francisco, Calif., and dated March, 1938, discusses in detail the principal sources of tungsten and tabulates data on production and consumption.

WEIGHTS AND MEASURES Recommended specifications, tolerances

Super-Service Radial Drill Saves 50%
Schramm, Inc., at West Chester, Pennsylvania, report that this 5' arm, 15" diameter column SUPER SERVICE Radial Drill has increased production more than 50%.
Performing an important operation on Schramm Compressors . . . . .
SCHRAMM
Boring cylinders in the block of the Schramm "Utility" air compressor is one of the most important operations in the production of these nationally known, stationary compressor units. Accuracy and smooth cutting, of paramount importance in this phase of production—are achieved through the use of a Super Service Radial. Diameter of bore is 5¼" in the larger compressors, although smaller bores and a diversity of work are also handled on this machine.
Ability to perform precision boring operations successfully and economically is but another reason why progressive manufacturers rely on Super Service Radials.
THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI, OHIO, U. S. A.

and regulations for all sorts of commercial weighing and measuring devices are contained in Handbook H22, which has been released by the National Bureau of Standards, Department of Commerce. Printed sheets showing changes in and amendments to codes published in the handbook will be issued from time to time. Copies of the handbook can be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 50 cents each.

NEW BOOKS

GRAPHIC ROUTES TO GREATER PROFITS. *By John Walter Esterline. 320 pages, 8½x11 in. Indexed and fully illustrated. Fabricoid binding. Published by The Esterline-Angus Co., Indianapolis, Ind. Price,* $3.

More than 250 case studies, each covering a distinct problem and giving the procedure followed, the graphic charts obtained and the solution reached, are included in this book on the use of graphic instruments in the industry. The high cost of inefficiency, what graphical representation means and a classification of industrial problems are discussed in the introductory section, which comprises 30 pages and is divided into three chapters.

The remainder of the book is in five divisions, which deal, in turn, with the problems of power, machines, processes, men, and research and special problems. Case studies throughout the book are numbered serially and carefully cross-indexed. Graphic chart sections illustrate each of the case histories. These charts, together with photographs, serve to point out definite advantages in the use of graphic instruments.

TAFT-PEIRCE originated and patented the design for Ring Thread Gages which is now the A G D Standard. And Taft-Peirce continues to make these gages to its own standards of precision manufacturing, electric heat-treating, and thoroughgoing inspection . . . to assure you the maximum amount of accurate gaging per dollar of cost. Write for new Handbook to The Taft-Peirce Mfg. Co., Woonsocket, R. I.

USE TAFT-PEIRCE GAGES

FOR EVERY **GAGING NEED**

PATENTS

April 12, 1938

Metal-Working Machinery

Upsetting Apparatus. Herrmann Finzel, Frankfort-on-the-Main, Germany. Patent 2,113,583.

Lathe. Karl Tessky, Esslingen-on-the-Neckar, Germany. Patent 2,113,668.

Forming Machine. Henry A. Berliner, Washington, D. C. Patent 2,113,716.

Polishing Apparatus. Alfred E. Hamilton, Pittsburgh, Pa. Patent 2,113,836.

Hydraulic Speed Press. Ransom Tyler, Greenfield, Wis., assigned to The Oilgear Co., Milwaukee, Wis. Patent 2,114,005.

Swaging Machine. Burnie L. Benbow, Euclid, Ohio, assigned to General Electric Co., Schenectady, N. Y. Patent 2,114,171.

Multiple Spindle Automatic Lathe. Frank L. Cone, Windsor, Vt.; Raymond H. Cone, Henry L. Chaplin and Horace P. McClary, Windsor, Vt., executors. Patent 2,114,177.

Parts and Mechanisms

Threaded Fastener. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works, Chicago, Ill. Patent 2,113,600.

Control Means for Toroidal Race and Roller Power Transmission Mechanism. John O. Almen, Royal Oak, Mich., assigned to General Motors Corp., Detroit, Mich. Patent 2,113,638.

Welding (Control). Walter Stewart Simmie, Oxford, England, assigned to Pressed Steel Co. Ltd., Cowley, Oxford, Oxfordshire, England. Patent 2,113,664.

Spindle Head. Joseph Verderber, Cleveland, and Elmer F. Batterman, East Cleveland, Ohio. Patent 2,113,751.

Clutch. Oscar I. Judelshon, Park Ridge, N. J. Patent 2,113,791.

Reduction Gear. George H. Acker, Shaker Heights, Ohio, assigned to The Cleveland Worm & Gear Co., Cleveland, Ohio. Patent 2,113,868.

Spindle Head. Joseph Verderber, Cleveland, and Elmer F. Batterman, East Cleveland, Ohio. Patent 2,114,039.

Variable Speed Transmission. Alfred G. Bade, Milwaukee, Wis., assigned to The Falk Corp., Milwaukee, Wis. Patent 2,114,245.

Processes

Methods of Coating Ferrous Materials with a Copper-Rich Alloy. Willis C. Swift, West Alexandria, Ohio, assigned to The American Brass Co., Waterbury, Conn. Patent 2,113,667.

Welded Joint and Method of Making the Same. Russell Franks, Niagara Falls, N. Y., assigned to Union Carbide & Carbon Corp., New York, N. Y. Patent 2,113,937.

Tools and Accessories

Rubbing Machine (Abrasive). Ottmar A. Kehle, Detroit, Mich., assigned to Sterling Products Co., Detroit, Mich. Patent 2,113,694.

Tool for Pulling Inside Axle Bearing Cones. Arthur G. Billington, Rye, N. Y. Patent 2,113,755.

Apparatus for Cutting or Stamping Articles from Sheet Material. Oscar C. Kavle, Syracuse, N. Y. Patent 2,113,843.

Drafting Instrument. Robert M. Lindsay, Oak Park, Ill., assigned to Metal Specialties Mfg. Co., Chicago, Ill. Patent 2,114,081.

Industrial Truck. Sheldon K. Towson, Cleveland Heights, Ohio, assigned to The Elwell-Parker Electric Co., Cleveland, Ohio. Patents 2,114,156 and 2,114,157.

Industrial Truck. Clyde E. Cochran, Cleveland, Ohio, assigned to The Elwell-Parker Electric Co., Cleveland, Ohio. Patent 2,114,165.

April 15, 1938

Metal-Working Machinery

Punching Machine and the Like. Paul C. Klingler and George B. Scheffey, Riverside, N. J., assigned to Super-Speed Press Corp., Riverside, N. J. Patent 2,112,850.

Machine for Forming Gears. Julian L. Perkins, West Springfield, Mass. Patent 2,112,996.

Grid Casting Machine. Lora E. Poole, Anderson, and Everett W. Beekman, Muncie, Ind., assigned to General Motors Corp., Detroit, Mich. Patent 2,113,033.

Hydraulically Operated Mechanical Press. Walter Ernst and Don C. Youngblood, Mount Gilead, Ohio, assigned to The Hydraulic Press Corp., Inc., Mount Gilead, Ohio. Patent 2,113,110.

Hydromechanical Press. Howard F. MacMillin and Don C. Youngblood, Mount Gilead, Ohio, assigned to The Hydraulic Press Corp., Inc., Wilmington, Del. Patent 2,113,115.

Riveting Apparatus. Raymond S. Osborne, Sewickley, Pa. Patent 2,113,161.

Machine for Grinding and Sharpening Broaches. William G. Baldenhofer, Springfield, Ohio, assigned to The Thompson Grinder Co., Springfield, Ohio. Patent 2,113,287.

Valve Grinding Machine. Herbert A. Silven, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,113,387.

Plastic Metal Molding Machine. Carl Roehri, Chicago, Ill. Patent 2,113,410.

Wire Coiling Machine. Otto N. Hanna, Newark, N. J., assigned to Parallex Corp., Newark, N. J. Patent 2,113,428.

Machine Tool (Milling). John R. Johnson, Rockford, Ill., assigned to The Ingersoll Milling Machine Co., Rockford, Ill. Patent 2,113,554.

Parts and Mechanisms

Stepwise Variable Change Speed Gear. Gustaf Emil Jonsson, Huddinge, Sweden. Patent 2,113,088.

Electrical Torque Transmission. Frank Whittle, Trumpington, England. Patent 2,113,102.

Deflection Compensator (For Machine Tool). William F. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt, Newark, N. J. Patent 2,113,124.

Dressing Apparatus (Grinding Wheel). Albert Vuilleumier, Bristol, Conn., assigned to General Motors Corp., Detroit, Mich. Patent 2,113,186.

Vertical Feed Controls for Rail Grinders. Milburn Moore, Brooklyn, N. Y., assigned one-half to Chester F. Gailor, New

Grinding Machine Headstock. Charles York, N. Y. Patent 2,113,276.

Harold Amidon, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,113,362.

Grinding Machine (Control). Charles H. Amidon, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,113,363.

Hydraulic Wheel Feed (Grinder). Albert G. Belden and Raymond A. Cole, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,113,367.

Grinding Machine Work Clamping Mechanism. Herbert A. Silven and Carl G. Flygare, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,113,388.

Gauge Mechanism. Byron F. Stowell, Springfield, Mass., assigned to Van Norman Machine Tool Co., Springfield, Mass. Patent 2,113,414.

Screw and Lock Washer Assembly. Edmond C. Crowther, Philadelphia, Pa., assigned to Illinois Tool Works, Chicago, Ill. Patent 2,113,424 and 2,113,425.

Universal Joint. George V. Curtis and Ralph E. Curtis, West Springfield, Mass. Patent 2,113,441.

Device for Controlling the Axial Thrust of a Shaft. George H. Leland, Dayton, Ohio, assigned to The Leland Electric Co., Dayton, Ohio. Patent 2,113,451.

Epicyclic Transmission Gear. Poul Arne Scott-Iversen, Copenhagen, Denmark. Patent 2,113,479.

Clutch. Henry Martin Kesterton, Wroxall, near Warwick, England. Patent 2,113,512.

Coupling Apparatus (Clutch). Leon de Montgrand, Marseille, France. Patent 2,113,515.

Processes

Method of Making Wrenches. Foster A. Haist, Buffalo, N. Y., assigned to J. H. Williams & Co., Buffalo, N. Y. Patent 2,112,840.

Manufacture of Headed Blanks. Robert J. Cordes, Cleveland, Ohio, assigned to The Lamson & Sessions Co., Cleveland, Ohio. Patent 2,113,172.

Tools and Accessories

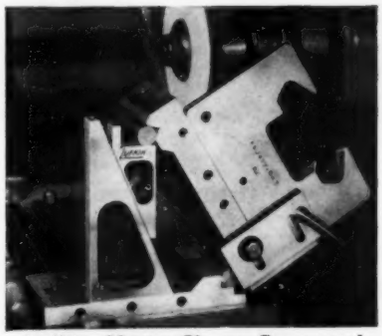
Hammer. John F. Hewitt and John

LUFKIN

MASTER PLANER GAGE —
Precision Tool OF THE YEAR

Mechanics all over the country are heaping praise on the new Lufkin Master Planer Gage. And for good reason. Surfaces on all sides of this new gage are precisely ground. The slide travels in a ground and beveled slot —eliminating side play.

Your tool room is not complete without a Lufkin Master Planer Gage.



Lufkin Master Planer Gage used with sine bar for grinding angles.

DOES A SCORE OF *Different* JOBS

Because of the accuracy of the Master Planer Gage, it can readily be set for use with a sine bar for grinding angles, with gage blocks for building up work and checking on a surface plate, for transferring measurements with an indicator and for many other uses beyond the limits of other planer gages.

Write for Precision Tool Catalog No. 7

NEW YORK
106 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN

Canadian Factory
WINDSOR, ONT.

TAPES — RULES — PRECISION TOOLS

H. Hoerster, Portland, Ore. Patent 2,113,084.

Manually Operated Pressure Tool. John Jensen, Rockford, Ill., assigned to Whitney Metal Tool Co., Rockford, Ill. Patent 2,113,087.

Abrading Apparatus (Disk). Kenneth H. Bowen, Auburn, N. Y., assigned to Columbian Rope Co., Auburn, N. Y. Patent 2,113,106.

Angle Cutter. Carl G. Gase, Parma, Ohio, assigned to Weldon Tool Co., Cleveland, Ohio. Patent 2,113,178.

Apparatus for Measuring the Stiffness of Flexible Materials. George H. Smith, Kenmore, N. Y., assigned to Ralph F. Taber, North Tonawanda, N. Y. Patent 2,113,389.

Protractor. Lem W. Wolfe, Maracaibo, Venezuela. Patent 2,113,524.

Railroads Abroad

RUSSIA—Speedy electrification of the railroads of the Soviet Republics in Russia is being continued. Upward of 440 kilometers of line were converted last year. Special interest attaches to the announcement from Moscow of plans for electrification this year of the 184-km. line from Apatity to Murmansk, and completion of the Moscow suburban network, which has been under construction for some time. The first line to be finished will be the Moscow-Tsaritsyno stretch, to be followed by the line from Tsaritsyno to Podolsk. It is planned to provide facilities to operate 200 trains daily in subruban traffic on the Yarorlav line, and 130 on the Leningrad branch. It is intended to add Kiev to the suburban network next year, the first sections to be from Kiev to Motovilovka and from Kiev to Fastoc. The lines are using high-speed locomotives of the PB type, capable of developing 120 km. per hr. Two fast trains of the SOU type, equipped with streamlined cars will be placed in service on the Yarsslav line.

FRANCE—Following a trial run with a new diesel-electric locomotive designed for passenger service between Paris and Dijon, France, during which an average speed of 125 km. per hr. was maintained, with a maximum of 138 km. per hr., six of these engines will be constructed for use between Paris and Nice. Two units are to be used immediately. It is estimated that the diesel-electric locomotive will make the run from Paris to Nice in about eleven hours, an average speed of 100 km. per hr. At present, owing to heavy grades in parts of the route, five different types of locomotive are used on this line, three of the Pacific and two of the Mountain type. The specifications call for locomotives able to make the Paris-Mentone run, 1111 km. in 10½ hr., not including eleven stops. This means an average of 130 km. over a large part of the run, and 85 km. per hr. in the long grades between Launes and Dijon and between Marseille and Freejus. The locomotives also must be able to cover 275,000 km. annually, and to operate with a maximum of 115 days annually for maintenance operations.

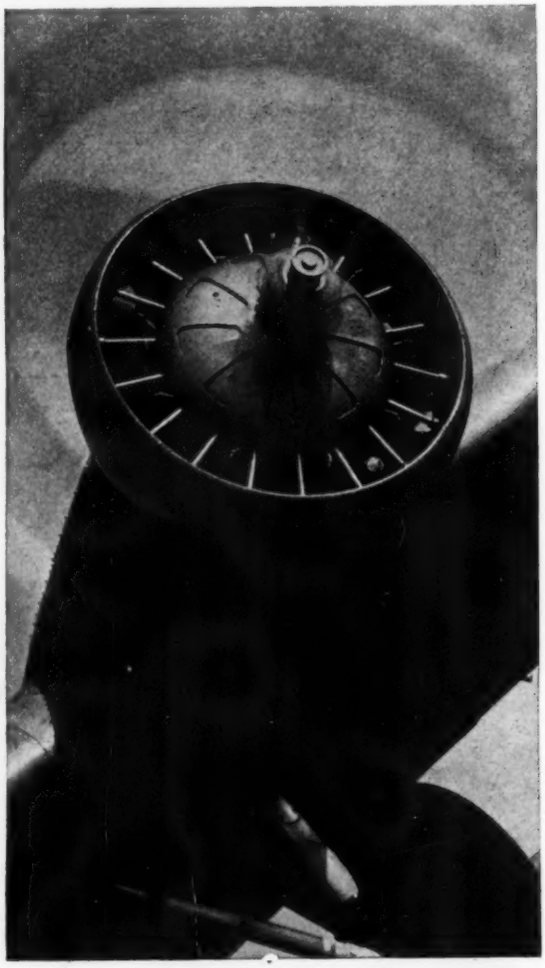
BRAZIL—Successful trial runs with a new Italian flat rail car is reported by the Central of Brazil Railway, which announces that the trip between Rio de Janeiro and Sao Paulo was made in eight hours and ten minutes with stops totaling 37 min., and that several similar units have been purchased and will be placed in service soon. The cars are equipped with two diesel flat motors of 145 hp., will carry 63 passengers and operate at a speed of about 90 km. per hr. The cars are provided with reversible seats, a buffet with folding tables, electric refrigeration and are air conditioned. They are built of steel and duralumin.

IF IT'S A

Jacobs

IT HOLDS

SUPER



The ability to function unfailingly under all conditions is the nearest approach to perfection . . . Try Jacobs Ball Bearing Super Chucks

THE JACOBS MANUFACTURING COMPANY
HARTFORD CONNECTICUT, U. S. A.